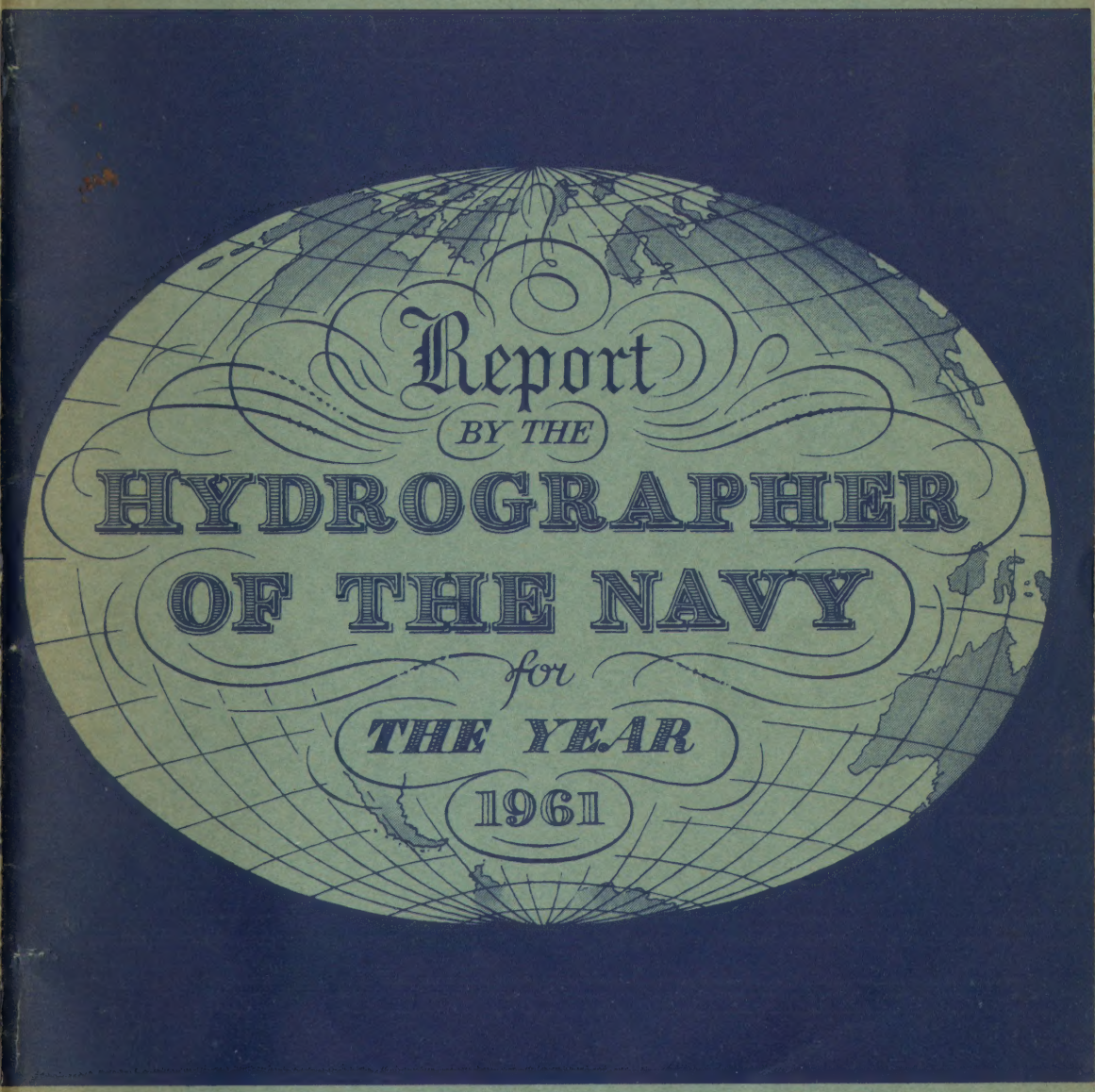

Report BY THE HYDROGRAPHER OF THE NAVY for THE YEAR 1961

20p

H.D.523

Report by the Hydrographer of the Navy for the year 1961

The following pages describe briefly the work of the Surveying Vessels of Her Majesty's Fleet and of the Hydrographic Department of the Admiralty.

E. G. Irving

Rear Admiral,
Hydrographer of the Navy.

30th June 1962
(HW. 939/61)

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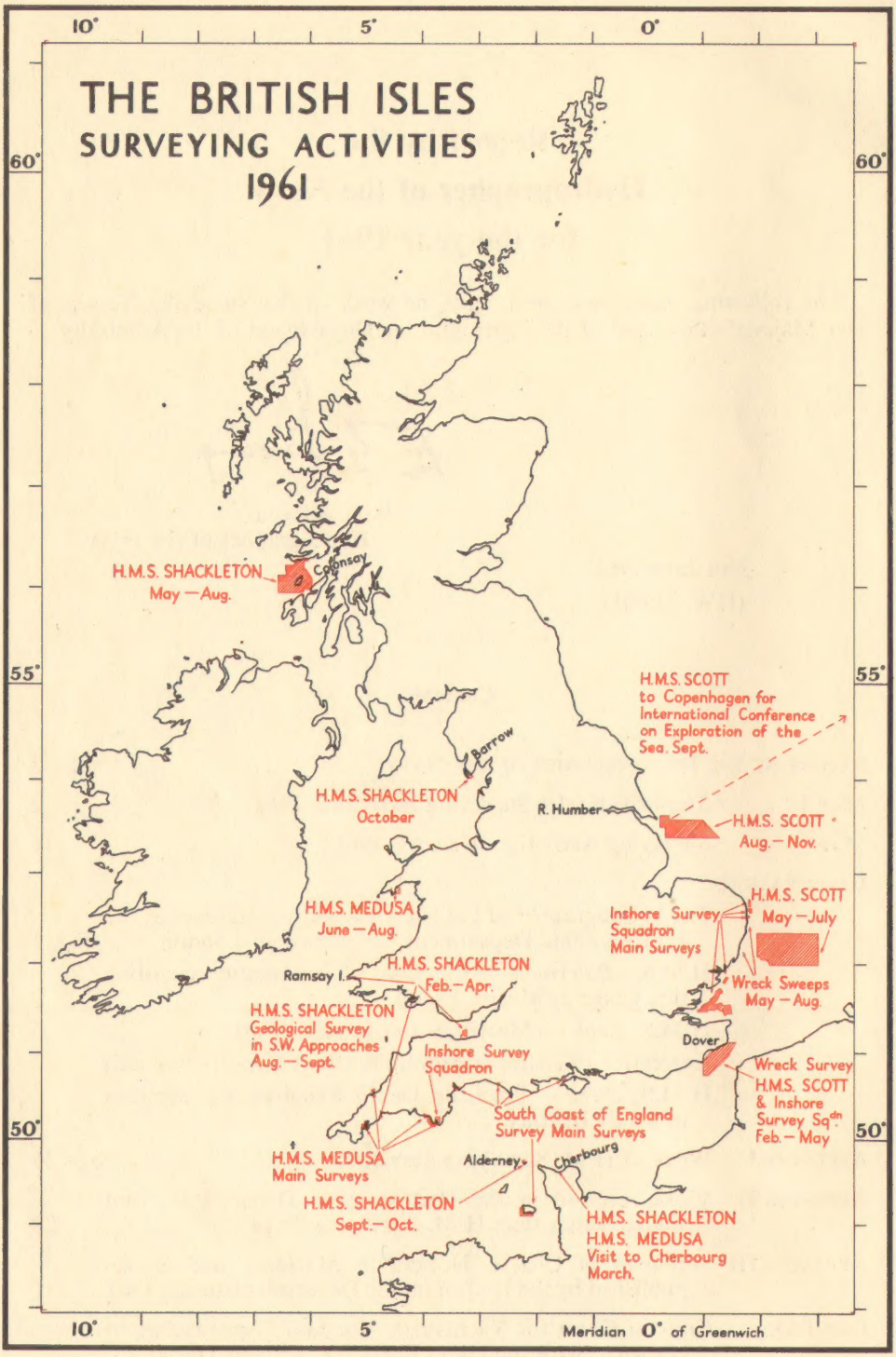

THE BRITISH ISLES
SURVEYING ACTIVITIES
1961
10°
5°
0°
60°
55°
50°
H.M.S. SHACKLETON
May — Aug.
Colonsay
H.M.S. SHACKLETON
October
Barrow
H.M.S. MEDUSA
June — Aug.
Ramsay I.
H.M.S. SHACKLETON
Feb. — Apr.
H.M.S. SHACKLETON
Geological Survey
in S.W. Approaches
Aug. — Sept.
Inshore Survey
Squadron
H.M.S. MEDUSA
Main Surveys
H.M.S. SHACKLETON
Sept. — Oct.
Alderney
Cherbourg
South Coast of England
Survey Main Surveys
H.M.S. SHACKLETON
H.M.S. MEDUSA
Visit to Cherbourg
March.
R. Humber
H.M.S. SCOTT
to Copenhagen for
International Conference
on Exploration of the
Sea. Sept.
H.M.S. SCOTT
Aug. — Nov.
H.M.S. SCOTT
May — July
Inshore Survey
Squadron
Main Surveys
Wreck Sweeps
May — Aug.
Dover
Wreck Survey
H.M.S. SCOTT
& Inshore
Survey Sqdn
Feb. — May
Meridian 0° of Greenwich

Report by the Hydrographer of the Navy, 1961

Surveying Ships and Craft

For the first time since 1955 all seven ships have been operational; the cycle of giving an extended refit to each ship in turn ended with the recommissioning of H.M.S. *Vidal* at Chatham on 12th September. The ships are now employed as follows: H.M.S. *Vidal* — West Indies, H.M.S. *Dampier* — Malaya and Borneo, H.M.S. *Dalrymple* — Persian Gulf and Mediterranean, H.M.S. *Owen* — Indian Ocean, H.M.S. *Cook* — South Pacific, H.M.S. *Scott* and H.M.S. *Shackleton* — Home Waters.

In addition, the Inshore Survey Squadron (H.M. Ships *Echo*, *Egeria* and *Enterprise*) have carried out surveys on the south and east coasts of England, and the two now elderly motor launches, H.M.S. *Medusa* and Fleet Survey Launch *Meda*, continue to operate satisfactorily on the south and west coasts.

Late in 1961 a contract was placed with a commercial firm for a design study of a new small surveying ship for service in Home Waters. This ship will eventually replace H.M. Ships *Shackleton* and *Scott*.

As in previous years there have been plenty of opportunities for Surveying Ships and Craft to play their part in general Fleet duties and ceremonial. H.M.S. *Vidal* was able to assist the Senior Naval Officer, West Indies, with hurricane relief work when hurricane "Hattie" struck British Honduras. She was also one of the two Naval Guard-Ships at Bermuda when the Prime Minister and the President of the United States of America held their meeting in December. H.M.S. *Cook*'s enthusiastic welcome when she returned to Fiji and her unofficial local title of "Her Majesty's Fijian Ship *Cook*" show the immense prestige value of the White Ensign in the remoter parts of the world. H.M.S. *Owen* also had particularly good opportunities, having ranged through the South Atlantic to the Indian Ocean during the period under review. Nearer home H.M.S. *Scott* visited Copenhagen, with the Hydrographer embarked, on a seven-day semi-official visit which coincided with the annual assembly of the International Council for the Exploration of the Sea. She was also in a position to stand by H.M.S. *Barmouth* while she drifted helplessly before a violent North Sea gale, having broken adrift from her tow.

Wherever there are British maritime interests and harbours to be surveyed, from the small drying haven to the busiest ports in the world, Surveying Ships will be seen and become well known sooner or later and they are remembered long after they have gone. The Hydrographer and his officers are very conscious of the valuable part which they are able to play in showing the flag and in charting the seas.

Equipment

Boat construction has now moved into the era of glass-reinforced plastics (G.R.P.) and a prototype new design 29-foot survey boat is under construction; a commercially produced hull of these materials is being used as the basis of this design. The boat will be at sea during 1962 for evaluation. Additionally, three commercial 18-foot G.R.P. launches will be purchased and fitted with echo-sounding equipment for use in the Inshore Survey Craft.

Successful trials of the Kelvin Hughes "Fisherman's Asdic" were held in the spring of 1961, and the three Inshore Survey Craft are currently being fitted with this equipment, unmodified. This will greatly increase the ability of these craft to search for, and fix, wrecks and other obstructions in the debris-scattered areas off the east and south-east coasts.

The fitting of the new dry-paper echo-sounders continues and it is expected that all the major ships and craft will have this equipment by the end of 1962.

Electronic fixing aids continue to play a major part in hydrographic surveying. Two-Range Decca and the accurate surveying Radar are much used; while the introduction of a special survey receiver enables ships and boats to use existing Decca Navigator coverage where applicable. H.M.S. *Echo* employed a Hydrodist equipment to control a survey off the east coast of England; it is expected that further Hydrodist equipments will become available in 1962.

By use of Tellurometer equipment, the basic framework for control of surveys can now be established by trilateration considerably more quickly than by triangulation using conventional theodolite methods.

As a result of these advances in scientific techniques surveying officers and recorders are having to widen their basic knowledge of electronic and other sciences.

The Hydrographic School

In an endeavour to check the current shortage of Surveying Recorders, two courses for junior ratings were run this year. The first of these started in January and it says much for the west country climate that little disruption occurred through wintry weather.

The second course for junior ratings was finished in time for the qualifiers to take part in the annual Tidal Month observations which, this year, were made at a number of stations from Looe to Newlyn. A Surveying Recorder 1st Class is now borne solely for tidal duties and he has a base and a store in the school.

Seven officers of Navy Works Department, some Civil Engineers and some Draughtsmen were given training in Hydrographic Surveying during July. Subsequently in November to December they carried out a dredging survey in Plymouth Sound using facilities provided by the School.

The major course of the year, that of ratings qualifying for Surveying Recorder 1st Class, was also started in July and finished in November. Trainees, as part of the course, made a survey of Falmouth Harbour and carried out some large-scale work at Mylor and Truro.

The course for Surveying Recorder 2nd Class contains in its syllabus much theoretical Oceanography and an interesting innovation this year has been a visit to the laboratories of the Marine Biological Association, Plymouth, where the course was able to see some practical aspects of oceanographical work.

Work Study

Due to the present shortage of officers the activities of Fleet Work Study Team No. 8 came, regrettably, to an end in August. By their efforts a system of hull cleaning and maintenance and a work control system have been installed in H.M. Ships *Cook*, *Dalrymple*, *Owen* and *Vidal*. The prime object of the work control system is to assist the command, i.e. First Lieutenant, Boatswain and Chief Boatswain's Mate, to exercise more control over the work carried out by the seamen and to ensure that they are usefully employed during the period during which they are available for work, thus improving the standard of upkeep of those parts of the ship for which the seamen are responsible. Reports from sea on the working of the system have, on the whole, been encouraging.

Work Study continues at the Hydrographic Supplies Establishment at Taunton.

Loan and Exchange of Surveying Personnel, Training

During the year surveying officers have served in exchange appointments with the Royal Australian, Royal New Zealand and South African Navies.

A number of Royal Naval Reserve officers have completed periods of training in Surveying Ships. Foreign and Commonwealth Hydrographic Officers have been given short periods of training at Chart Branch and Taunton.

Frequent requests from Royal Naval Reserve Divisions for lectures on various aspects of Hydrographic Surveying have been met.

Visits and International Conferences

The Hydrographer paid his customary visits to surveying units as follows:

F.S.L. *Meda*, on 13th April at Bembridge.

H.M. Ships *Dalrymple* and *Owen*, on their return home on 30th May, joining H.M.S. *Owen* at sea by helicopter from the Royal Naval Air Station, Culdrose.

H.M. Ships *Shackleton* and *Medusa*, on 4th September at Devonport.

H.M. Ships *Dalrymple* and *Owen*, before sailing for foreign surveys, 19th September at Devonport.

H.M.S. *Vidal*, before sailing for foreign surveys, 24th October at Portland.

The Hydrographer visited Washington, 16th–18th January, to attend the opening of the National Oceanographic Data Centre and to visit the United States Hydrographic Office (Rear-Admiral E. C. Stephan, United States Navy) and the United States Coast and Geodetic Survey (Rear-Admiral H. A. Karo, United States Coast and Geodetic Survey).

Between 27th September and 4th October, he attended the opening of the International Council for the Exploration of the Sea at Copenhagen, taking passage in H.M.S. *Scott*; he also visited the Danish Hydrographer, Commodore Carl Madsen, Royal Danish Navy.

On 26th October the Hydrographer took the chair at the first meeting of the Institute of Navigation Working Group on Traffic Regulation in the Straits of Dover.

The following distinguished foreign visitors were received by the Hydrographer:

The Director of the Ports and Lights Administration, United Arab Republic, Admiral Youssef Hammad, on 17th April.

The French Hydrographer, Ingénieur Hydrographe Général de 1re Classe André Gougenheim, on 20th April.

Vice-Admiral Alfredo Viglieri, a Director of the International Hydrographic Bureau, on 10th July.

Ingénieur Hydrographe Général de 1re Classe Leon Damiani, a Director of the International Hydrographic Bureau, on 20th September.

The United States Hydrographer, Rear-Admiral Edward Stephan, on 1st and 2nd November.

Activities of the Surveying Ships and Units since the last Annual Report

H.M.S. VIDAL (*Captain C. R. K. Roe, D.S.C., Royal Navy*), recommissioned for service in the West Indies in September, having completed a year's refit in Chatham Dockyard. During this refit Two-Range Decca Lambda equipment and an enclosed bridge housing all echo-sounding and electronic survey aids, the steering position and normal navigational instruments, was installed. The crew's accommodation was also modernised.

The ship sailed from Chatham for final trials early in October and after visiting Portsmouth where the ship's helicopter was embarked, and Portland where the Hydrographer visited her, she sailed for the West Indies in a south-westerly gale. This prevented any ocean sounding work until nearing the vicinity of the Azores.

A few days later orders were received to proceed to Kingston, Jamaica, and thence to British Honduras to assist in relief work following hurricane "Hattie". After a brief visit to Antigua to off-load stores and exhibits for the opening ceremony of the recently restored dockyard at English Harbour — a ceremony in which the ship had been scheduled to take part — Kingston was reached on 9th November and having embarked 25 tons of hurricane relief stores, together with fifty men of the Worcestershire Regiment, the ship sailed for Belize. The next ten days were spent mainly in providing aid for the outlying villages southwards of the capital as H.M.S. *Troubridge* was coping with the devastation in Belize itself. During this period the R.M.S. *Essequibo*, aground in the entrance channel to Belize, was successfully refloated with the aid of H.M.S. *Vidal.*

The ship completed her work in the area on 26th November, when she sailed for Kingston. On arrival there, orders were received to return to Belize to convey the retiring Governor, Sir Colin Thornley, K.C.M.G., C.V.O., O.B.E., to Jamaica. Before she left Jamaica a detached surveying party was landed to carry out an exploratory survey in the approaches to Portland Bight.

His Excellency and Lady Thornley were embarked at Belize with due ceremony and after an uneventful, though rough, passage they were landed at Kingston where the ship remained for a short rest.

Having recovered the detached party from Portland Bight, H.M.S. *Vidal* sailed for Bermuda where she assisted H.M.S. *Troubridge*, wearing the Broad Pendant of the Senior Naval Officer, West Indies (Commodore J. E. L. Martin, D.S.C., Royal Navy), in various duties during the conference between the Prime Minister and the President of the United States. On completion of this commitment, the ship sailed for surveys in Barbados.

During this period a detached party also carried out a small survey at Nassau, Bahamas, and minor work was undertaken in the various ports visited as opportunity offered. The main contribution during the short period of sea-time has been ocean soundings during nearly 11,000 miles of passage.

H.M.S. DAMPIER (*Commander J. D. Winstanley, Royal Navy*) sailed from Singapore, on completion of her annual refit, at the beginning of March.

A detached survey party with two sounding boats was established in order to continue the surveys of the western approaches to Singapore which had been started last year. This was a formidable task for a small party as it covered all the islands and channels on the west side of Singapore and already several major changes had been found.

The ship continued up the west coast of Malaya to put in hand the survey of the approaches to the Perak River where it was reported that extensive silting had taken place since the last survey in 1931. This survey was completed in early April when the ship returned to Singapore to assist the detached party with

repairs to boats and equipment and to effect the changeover of the advance party of the new commission. In the meantime a small reconnaissance team was operating on the east coast of Malaya selecting suitable sites for Two-Range Decca stations whilst a further party was engaged on thirty days' tidal observations northwards of Kuantan.

In mid-April the Two-Range Decca equipment was despatched from Singapore in a convoy of lorries to the sites selected on the east coast. The ship followed after storing and fuelling, first to assist with the erection of the stations at Mersing and Kuantan and also to carry out a small survey southward of Tanjong Gelang. After calibration, the Decca equipment was used to survey a submarine exercise area 50 miles off the Malayan coast. Once started, the work continued night and day until the area of 800 square miles had been completed. Early in May all parties were recovered and the ship returned to Singapore where the detached survey party were collected prior to sailing for surveys in north-west Borneo.

Working out of Jesselton, two surveys were taken in hand simultaneously — Usukan Bay to Pulau Silad and Usukan Bay. During this period a ceremonial guard was prepared for the parade in honour of the birthday of Her Majesty, The Queen. The march past was led by H.M.S. *Dampier*.

In mid-June these surveys were broken off for the ship to return to Singapore for recommissioning. To enable the ship's company to accustom themselves to the ship and their new tasks, the next three weeks were spent completing the surveys of the western approaches to Singapore. The mid-seasonal docking and maintenance period followed during which charts were progressed and assistance was given to the Department of Scientific and Industrial Research in establishing their satellite tracking station at Sembawang.

After storing to maximum capacity the ship sailed for Borneo on 21st August, firstly to Kuching, the capital of Sarawak, to discuss future surveys with the Marine Department and then to Usukan Bay to complete the survey there. After this the ship proceeded to Darvel Bay, on the east coast, to put in hand the major surveys of the season. Whilst on passage round the north end of Borneo passage soundings revealed an uncharted shoal and a day was spent examining it.

Between mid-September and mid-November two surveys were carried out simultaneously, one by the boats from Lamak Bay to Sakar Island and covering the important area of Silam Harbour, the other by the ship farther eastward in the deeper water. Before sounding could be started a major triangulation had to be laid down linking these surveys with those of 1958. This meant establishing nineteen triangulated main stations over an area of about 600 square miles. The majority of these stations required jungle clearing and during the first month 103 members of the ship's company were employed in this work. Two of the stations were on mountain-tops, one 1,500 feet and the other 2,000 feet high, both mountains being clothed with dense jungle from the foot to the summit. During these surveys the majority of week-ends were spent on the survey ground, with occasional visits to Sandakan and Tawau.

In mid-November the ship sailed for Pura-Pura Island to investigate a possible sheltered anchorage for ships loading oil-palm produce from the interior during the north-east Monsoon. On completion H.M.S. *Dampier* returned to Singapore for her annual inspection and storing.

The last part of the year was spent surveying the approaches to Penang. By using the ship's radar in conjunction with floating radar reflecting beacons about 300 square miles were completed in time for the ship to return to Penang for Christmas.

H.M.S. DALRYMPLE (*Acting Commander M. J. Baker and Commander H. R. Hatfield, Royal Navy*) returned to the Straits of Hormuz after Christmas and continued to survey there until mid-February. The ship refuelled and

stored at Bahrain every third week-end, the Sundays in between being spent at Khor Quwai, which proved an excellent place for fishing and bathing parties. Mail was collected at Sharjah, where a tide-gauge had been established, the rating looking after the gauge being accommodated in the Royal Air Force station there. The passages between Sharjah and the survey ground enabled the existing gaps in the charted soundings to be filled in.

During this period a detached party consisting of two boats' crews was left in camp at Khor Quwai for a week during which they completed the inshore soundings. Tidal stream observations were also carried out in the Khor by the ship. Whilst on passage to and from Bahrain observations to measure the errors of the newly established Persian Gulf Decca Chain were made and the Shah Allum Light float was fixed by Decca.

Weather and visibility were generally excellent, enabling the sounding in the south-eastern portion of the survey to be controlled visually, a welcome change from the usual Two-Range Decca dial reading.

The ship left Bahrain finally on 6th February and collected the Decca Slave camps on the Persian Islands of Henjam and Larak in record time. The tide gauge and its attendant from Sharjah were also safely embarked despite a heavy swell from the last shamal.

On passage to the Mediterranean a call was made at Masira Island where a site for a projected tide gauge was surveyed. The Captain was landed there and flown to Aden with suspected appendicitis, where he rejoined the ship on arrival. On passage to Aden oceanic soundings were obtained and on passage through the Red Sea six oceanographical stations were made and a reported 18-fathom shoal to the north-westward of Jebel Attair was confirmed and fixed.

A fortnight was spent at Malta carrying out local surveys. The ship then sailed for Sicily and after embarking a liaison officer of the Italian Navy, Two-Range Decca slave stations were set up at Marsala and Cape San Marco to enable a survey of the Adventure Bank to be undertaken. This survey was completed in six weeks despite bad weather, which on one occasion flooded the slave station at Marsala, forcing the occupants to box up the equipment. However, the bad weather was more than compensated for by the efficiency, courtesy and general friendliness of the local officials and people. At the end of the survey the weather improved, enabling both slaves to be embarked over the beaches. After a call at Gibraltar, the ship arrived at Plymouth on 18th May for refit and annual leave.

During her annual refit, four sets of boat's falls were modified, replacing cordage with wire falls to individual winches. This new arrangement has proved most satisfactory, and the convenience and safety of hoisting and lowering boats in rough weather has been markedly improved.

On completion of the refit, H.M.S. *Dalrymple*, under the command of Commander H. R. Hatfield, sailed from Devonport in mid-September for the Persian Gulf once more. On passage calls were made at Gibraltar, Malta and Aden; small surveys were carried out off the north-west coast of Spain and at Malta. An automatic tide-gauge was established at Masira Island where some sounding was also carried out in the anchorage. It is hoped that this tide-gauge will provide a continuous record of tidal movement for a year or more in a part of the world where tidal information is virtually non-existent.

After a few days at Bahrain for self-maintenance the ship sailed for Abu Dhabi where a shore party consisting of three officers and thirteen ratings, operating two boats, were landed on the island of Al Bahrani. This party started the main Persian Gulf survey, that of the approaches to Abu Dhabi, while the ship returned to Bahrain to complete high priority work which was outstanding in the Sitra Channel. This was finished in early December, the ship then returning to Abu Dhabi where she worked until Christmas. During this

FIG. 1—The Hydrographer of the Navy's weekly conference at the Hydrographic Department, Cricklewood, London

FIG. 2—H.M.S. *Dalrymple*—Erection of automatic recording tide gauge at Masira Island

FIG. 3—H.M.S. *Cook*—March past at Levuka (Fiji)

survey Sheikh Shakbut bin Sultan, the ruler of Abu Dhabi, and four other sheikhs were taken to sea for four hours and showed great interest in the proceedings.

Christmas was spent at Kuwait where the residents did their utmost to make it an enjoyable time for the ship's company. Before leaving a small party was landed to carry out a survey of the approaches to the port.

On passage outward from England, a party of scientists from London University was embarked. They operated a Proton Magnetometer which was towed behind the ship for almost the entire voyage. These observations will be of particular interest to the International Indian Ocean Expedition. The scientists also obtained samples of the sea-bed by corer in the entrance to the Persian Gulf. Later they worked independently on the Trucial coast, using their own 18-foot glass fibre boat, continuing their investigations into the morphology of the sea-bed.

H.M.S. OWEN (*Commander G. P. D. Hall, D.S.C., Royal Navy*), working in South Atlantic waters, reached Tristan da Cunha on 4th January. Here she carried out local surveys and made scientific observations while participating in social and sporting activities with the islanders. Because this, one of the world's loneliest islands, has no doctor and a number of cases were causing anxiety, the ship's medical officer was landed there for a month while the ship continued her oceanographical cruise to South Africa.

Whilst at Simonstown the Commander-in-Chief, South Atlantic and South America, took the opportunity to carry out the ship's annual inspection. At the end of the month H.M.S. *Owen* set course westward for Gough Island (250 miles south-eastward of Tristan da Cunha), where she made magnetic observations ashore. The medical officer rejoined, having made the passage in a fishing vessel, bringing with him a present of freshly caught lobsters.

Continuing her ocean traverse southward, the ship entered the Roaring Forties early in February and three days later encountered ice. Twenty-four hours were spent in threading her way through a 200-mile belt of icebergs, mostly in fog and darkness, and on 12th February she reached South Georgia and re-embarked her advance survey party at Elsehul, where they had been landed by H.M.S. *Protector* and encamped ashore for two months establishing ground control. After visiting the Administrator at King Edward Point, the ship established a base at Bird Island and detached boat-parties to carry out large-scale surveys in that area. After landing scientists from Birmingham University at Royal Bay, the ship worked her way southward through fog and ice through Cooper Strait to Drygalski Fjord where she awaited a lull in the weather. When this came she ventured round Cape Disappointment to land Mr. Duncan Carse's one man scientific expedition. This was done with some difficulty, the operation being interrupted by the untimely onset of a gale. The ship recovered her boats and weighed anchor just in time to avoid being struck by several icebergs being driven down upon her by the fierce wind. Two days later the operation was completed, Mr. Carse being established ashore with hut, stores and three boats, to commence his two years' solitary vigil.

For the next six weeks the ship continued her surveys round the coasts of South Georgia while the boats progressed the sounding of Stewart Strait, Bird Island, Elsehul and the Undine Harbours. Work was constantly hampered by harsh conditions, gales, heavy seas, fog, snowstorms, icebergs, pinnacle rocks and prolific kelp weed. One of the boats foundered in Bird Strait, mercifully without loss of life. This period of surveying, in conditions as bad as could be encountered anywhere in the world, was an extremely anxious time.

At the end of March, with the southern autumn drawing in, the ship made a rendezvous with the Commander-in-Chief, returning from the Antarctic in H.M.S. *Protector*, and a week later completed her final circumnavigation of the

island with a last look-in on Duncan Carse. Camps at Right Whale Bay and Bird Island were struck, and in a rising gale, with all parties embarked, the ship set course for the Falkland Islands through crowding icebergs.

After leaving these islands oceanographical work was continued along the edge of the Argentine continental shelf, with a two-day call at Montevideo during which a visit was paid to the Uruguayan Hydrographic Institute. A five-day official visit was also paid to Buenos Aires where a close liaison was established with the Argentine Navy and the ship's company enjoyed a full sporting, social and recreational programme before setting off again into the Atlantic on a 4,000-mile oceanic sounding traverse. This took the ship over the Bromley Plateau to the mid-Atlantic Ridge and thence to Sierra Leone. Ninety-five oceanographical stations were made and some interesting photographs obtained of parts of the deep-sea floor. A brief call was also made at Ascension where survey work was carried out.

After embarking fuel at Freetown the ship sailed northward to Teneriffe, largest, loftiest and most romantic of the Canary Islands, where a week-end was spent at Santa Cruz. Various shoals reported off the Mauritanian coast were disproved on passage. From the Canaries the ship continued her northward passage, discovering a new sea-mount and disproving the existence of a shoal reported near the Gettysburg Bank. Heavy weather was encountered in the Bay of Biscay which put a stop to further oceanographical work.

The ship was welcomed off the Cornish coast by the Hydrographer who embarked from a helicopter and she finally berthed at Plymouth on 30th May. During the course of the year the ship had visited 6 foreign Hydrographers, called at 15 foreign ports, carried out 19 surveys, obtained 62 sediment cores, occupied 104 oceanographical stations, made 426 bathythermograph observations, run 26,152 miles of new oceanic soundings and, in 225 days spent at sea, steamed 40,660 miles.

During the summer refit period the ship was fitted with instruments to enable her to take her part in the International Indian Ocean Expedition. These consisted of a gravimeter, magnetometer, a Precision Depth Recorder and an additional deep-sea echo-sounder. Early in October she sailed for the Indian Ocean with six scientists on board, three of whom would remain and three of whom would disembark at Gibraltar. A continuous bathymetric, gravimetric and magnetic traverse was run on passage through the Mediterranean. A further traverse was run down the Red Sea until the ship reached the Haycocks, three small Ethiopian islets, where a survey was carried out to investigate a reported shoal in one of the channels. Before the work could be completed, the ship was diverted to Perim Island where a critical fresh-water shortage was reported. The water distillation plant was put in order and the ship proceeded to Aden.

On passage from Aden to the coast of Kenya difficulty was experienced in measuring the earth's magnetism due to the very small "dip" and the small angle of "cut" with the magnteic meridian in these latitudes. This problem was solved by towing the magnetometer in a vertical position on a specially constructed raft.

On arrival at Lamu, the second port of Kenya, a large camp party was established ashore to progress a survey of the harbour and approaches. At the same time the ship put in hand an extensive survey of the off-shore approaches to Lamu, Manda and Patta Islands. Mombasa was visited and some assistance was given with flood relief work during this period.

Early in December the ship sailed for the Seychelles, running a magnetic and bathymetric traverse *en route*. Traverses were also run across parts of the Seychelles Bank and samples of the sea-bed obtained for scientific analysis. Large magnetic anomalies were found among the islands. Port Victoria was

visited where arrangements were made for the installation of an automatic tide-gauge and some reconnaissance work was done with a view to a future survey.

On passage back to Kenya the towed magnetometer was unfortunately lost on an uncharted coral head. Christmas was spent at Mombasa before returning to Lamu to take off the detached party who had made good progress with their survey.

The remainder of H.M.S. *Owen*'s season will consist of further traverses in the Indian Ocean and further survey work off the coast of Kenya, before she returns to England at the end of May.

H.M.S. COOK (*Commander J. Paton, Royal Navy*) commissioned at Singapore on 20th March after completing a major refit during which the living accommodation was modernised and new Lambda Two-Range Decca, radar and echo-sounders were fitted. A month later she sailed for a shake-down survey off the east coast of Malaya. On completion of this survey, the ship sailed for Vila in the New Hebrides via Borneo and New Guinea. While on passage ocean soundings were taken on the route of the proposed round-the-world Commonwealth telephone cable.

At Vila the Commanding Officer represented the Hydrographer of the Navy in discussions with the French Navy and Condominium authorities on the hydrographic survey requirements within the New Hebrides group, which are very poorly charted. Rugby football was introduced to the local inhabitants during this visit and the Vila Rugby Football Club was formed as a result.

The next port of call was Suva, for discussions with local authorities on the ship's surveying programme which would be confined to Fijian waters for the next five months. During her stay in the Islands it was made clear that the ship was to be welcomed everywhere she went as an old friend and that a fine fund of goodwill had been built up by the previous commission. Indeed, the ship is locally referred to as Her Majesty's Fijian Ship *Cook*.

On sailing for surveys in the north-western part of Vanua Levu the Commanding Officer was informed that the Fijian Chiefs of the Mathuata Province wished to welcome the ship in the traditional way. The following is extracted from his Report of Proceedings:

> "The ship was met off the village (Nanduri) by an outboard-engined canoe, loaded to the gunwales with several chiefs and my herald (or Mativanua) who was to speak for me during the subsequent ceremonies, the first of which took place on the quarterdeck. I was presented with two Tambua (whale's teeth), one of which signified permission to anchor and would have been brought out in the old days by swimmers, whilst the other gave permission to land. I then proceeded ashore with about fifty of my ship's company for the Yaquona Vakaturaga and Wase Ni Yaquona, the chiefly mixing, presentation and drinking of yangona or kava. This was followed by many Mekes or dances accompanied by singing. The ceremony ended with the presentation to the ship of much fruit and a giant live turtle."

Immediately after this most memorable occasion the surveys of Sau Sau Passage to Ringgold Channel and Langa Langa River to Tilangitha Pass were put in hand, the latter by a detached party at Visonggo village. This party was overwhelmed with kindness by the villagers whose houses were always open to the visitors and who constantly plied them with food and drink. There were many willing helpers to cope with the camp chores, and the party returned to the ship with many a backward glance.

The two surveys were completed by mid-September and the ship visited Suva for two days to fuel and store to capacity before sailing for the Gilbert and Ellice Islands. On arrival in the Gilbert group a detached party was landed on the

island of Abaiang to progress the survey there while the ship proceeded to Tarawa which is the seat of government. Due to the great distance from the nearest supply of fuel, at Suva, the ship's stay in the islands was limited to only nine days but much useful preliminary work was achieved. It is hoped in future years to make two round trips to the islands leaving a detached party there during the intervening period.

On return to Fiji the ship proceeded to Levuka for a period of self-maintenance. She was able to take part in Fiji's National Day, the anniversary of the voluntary cession of the islands to the British Crown in 1874. A most impressive parade, made colourful by the different uniforms of the children from the various schools, marked the occasion.

The next survey was in the Tasman Strait, an area abounding in coral shoals, between the islands of Taveuni and Nggamea. During this survey the ship visited Savu Savu Bay, where, some months previously, a submarine volcanic disturbance had been reported. Unfortunately, bad weather limited the search in these dangerous waters to the taking of water temperatures and samples which gave a negative result. Before leaving the islands, the ship took part in a Remembrance Sunday parade at Suva.

Returning to Vila in the New Hebrides, a survey of the harbour was carried out. The Vila Rugby Football Club was found to be flourishing and the second game of their season (and era) was played against the ship's team.

On 23rd November, H.M.S. *Cook* sailed for New Zealand where she berthed at Auckland for docking and maintenance. The ship was inspected by the Commodore, Auckland, Commodore J. O'C. Ross, Royal New Zealand Navy, and the period in harbour was used in the drawing of charts and in collating the survey data gathered during the first part of the season. Opportunity was also taken to grant leave to the officers and men. Through the kind offices of the Chaplain of the Naval Base and of the Auckland Navy League, it was made possible for all who wished to spend their leave with families in various parts of the country and many of the ship's company enjoyed a real family Christmas.

The ship sailed for Vila and Suva once more, early in the new year.

H.M.S. SCOTT (*Lieutenant-Commander W. J. M. Roberts, Royal Navy*). Having completed the annual refit at Chatham, and post-refit trials in the Portsmouth area, survey work was started on 21st February.

The first task was a complete wreck survey of the South Foreland/Dungeness area. This work had been started in 1960, and because of the deep draught vessels, super tankers in particular, which now pass through these waters, it had been given a high priority. The weather during February and March was remarkably free of strong winds, but fog and low visibility were prevalent. These conditions, combined with sweeping operations and the heavy concentration of shipping in the area, called for the highest standards of vigilance and concentration from all watchkeeping personnel. The survey was finished on 11th May. Seventy-four wrecks had then been swept for determination of least depth, eighteen charted wrecks had been disproved, and many others had been examined or checked. Thirty-two of these wrecks had been drift swept by craft of the Inshore Survey Squadron who had assisted in the work since early April. It had been found that one ship and two survey craft constitute an efficient and economical force for major wreck surveys of this type. During the course of this survey S.S. *Lizziona* sank in the area after collision in fog. H.M.S. *Scott* found this wreck by Asdics and swept it for least depth within twenty-four hours of the collision. All the crew had been rescued before she sank.

The ship had returned to Chatham for Easter leave on 23rd March, and on the following day the ship's company took part in an impressive ceremony marking the closure of The Nore as an operational command and the lapse of

the Commander-in-Chief's appointment. Henceforth the ship was to be administered by Flag Officer Medway, and his Flag was temporarily hoisted in H.M.S. *Scott* on 31st March.

In mid-May, the ship moved north to the Harwich area where, on 13th May in glorious weather, members of the Field Survey Association were given a day at sea which included a visit to a Trinity House Lightvessel on station.

After another wreck survey, this time in the Orfordness/Lowestoft area, the month of June was spent surveying 800 square miles of the southern North Sea, using Two-Range Decca equipment.

This survey completed, the ship returned to Chatham; first for a full three-day inspection by Rear-Admiral I. W. T. Beloe, D.S.C., Flag Officer Medway, and his staff, and then to give summer leave.

Two surveys were undertaken by H.M.S. *Scott* during the latter half of the season. With the help of the surveying radar set and two large radar reflectors constructed specially for the task, the "Approaches to the River Humber" were completed by 19th September, and Two-Range Decca was again used in October and November to survey 280 square miles in the Outer Dowsing area.

The Hydrographer of the Navy embarked at Grimsby on 27th September for passage to Copenhagen. This seven-day semi-official visit, timed to coincide with the International Conference for the Exploration of the Sea, was the high-light of the season. It was most successful and was thoroughly enjoyed by everyone. His Excellency the British Ambassador, Sir William Montagu Pollock, and Vice-Admiral Pontoppidan, Commander-in-Chief Royal Danish Navy, were two of the distinguished visitors during the visit who took a great interest in the ship and her work. There was also a valuable exchange of visits with Commodore Madsen, his officers, and staff of the Hydrographic Offices of the Royal Danish Navy.

On the night of 18th October, H.M.S. *Scott* was sailed from the River Humber in a violent storm to assist R.F.A. *Warden* who had parted her tow to H.M.S. *Barmouth* off Flamborough Head. At that time the lives of the nine men aboard *Barmouth* were in jeopardy, but all ended happily when Royal Air Force helicopters lifted off the crew, and H.M.S. *Scott*'s boarding party subsequently managed to reconnect the tow. A few days later the ship was diverted to join a search for survivors from a missing B.66 United States Air Force bomber off the Norfolk coast, but this time without success.

During the year the ports of Dover, Harwich, Ipswich and Grimsby were used as operational bases. The ship returned to Chatham for leave and annual refit on 17th November.

Concurrently with her surveying activities, the ship undertook substantial training commitments. Nearly one hundred juniors from H.M.S. *Ganges*, in classes of twelve at a time, were given seven days' sea training, and in addition a number of parties of school children were given sea trips or were shown around the ship.

It is of interest to note that every survey undertaken by H.M.S. *Scott* in 1961 has depended almost entirely on electronic equipment for its positional control—either Navigational Decca, Two-Range Decca or surveying radar.

H.M.S. SHACKLETON (*Lieutenant-Commander R. A. G. Nesbitt, Royal Navy*) sailed from Devonport on 21st February and spent the first four days of the season surveying the small Cornish harbour of Mevagissey, an early start to the year's work being rewarded with weather in which the boats' crews were working in their shirt sleeves. By the end of the month the second task of the year, the survey of the area between Watchet and Weston Bay constituting the remaining part of the Bristol Channel not included in other post-war surveys, had been started and work proceeded here until the middle of March. Progress was disappointing owing to continual low visibility but, despite this, progress

was made with wreck surveys and in obtaining a set of core samples of the area for the Department of Geology of Bristol University. Owing to its relatively secondary importance, time could not be spared to complete more than half this survey and on 15th March the ship was sailed to Cherbourg to take part, in company with H.M.S. *Medusa*, in a liaison visit to the French Surveying ship *L'Amiral Mouchez*. After an interesting and valuable exchange of information, during which time the officers and men were handsomely entertained by their opposite numbers, the ship returned to the United Kingdom for the annual sea inspection carried out by the Commander-in-Chief Plymouth, and to grant Easter leave.

Surveying was resumed on 18th April when Ramsey Sound, off the westernmost tip of South Wales, was taken in hand to examine its possibilities as a special anchorage. This task, carried out in the intervals between gales, was completed eight days later and H.M.S. *Shackleton* then sailed for Belfast Lough where there were seven wrecks to be swept to complete a survey of the area carried out by H.M.S. *Enterprise* the previous year.

After finishing the work at Belfast the ship started on the Scottish leg of her season during the second week in May by taking in hand an area of some 260 square miles in the approaches to the Firth of Lorne, centred about Colonsay Island and bordering on Mull, Jura and Islay. After a good start in ideal conditions, the weather deteriorated at the beginning of June and for the two remaining months during which the ship was in the area little respite was experienced from fresh south-westerly winds with accompanying swell. While seldom stopping work completely, this weather was a continual brake on progress. During this period, Sundays were spent at Oban with a longer visit to Greenock at three weekly intervals to fuel and grant week-end leave. Various minor surveys in the Firth of Clyde and Loch Fyne were undertaken while on passage to and from Greenock and a number of core samples were obtained. The wreck *Breda*, near Oban, which had been found to be still dangerous in 1960, was again swept after successful demolition work in the interval.

Work scheduled in Scotland for 1961 was completed by the beginning of August and the ship then took passage to Liverpool to grant summer leave; further use was made of this break to bring routine machinery maintenance fully up to date with the aid of a shore contractor.

Before sailing from Liverpool on 21st August, seven scientists from the Universities of Durham and Bristol were embarked together with a sea-bed gravimeter and a magnetometer. The next fortnight was spent in geological surveys of the Irish Sea, Bristol Channel and the approaches to the Cornish coast whilst undertaking normal surveying work. The data was collected by anchoring the ship fore and aft at 5- to 10-mile intervals while the gravimeter was lowered to the sea-bed for a gravity measurement; at the same time a core sample was obtained. Between stations magnetometer traverses were carried out and the topography of the bottom examined by echo-sounder and fixed-beam Asdic. The complete data for the cruise comprised twenty-eight gravity measurements, fifty-five dredging and coring stations and about 1,200 miles of magnetometer, echo-sounder and Asdic records.

On 4th September the ship returned, after a six months' absence, to her base at Devonport. Here the Hydrographer of the Navy was embarked for part of the passage to the next operational area, in the Channel Islands, landing *en route* at Dartmouth. On arrival off Alderney, a large-scale survey of the Swinge Channel and its approaches was put in hand, all preparatory work having been carried out by a detached party operating during the ship's period of scientific work immediately previously. This proved a most interesting task owing to the very strong tidal streams in the area which often exceeded the speed of the boats. Three tidal stream stations were occupied; at two of these rates

of 7 to 8 knots at Springs were measured; giving the ship the unusual experience of steaming at slow ahead for some 24 hours while at anchor in calm weather.

The period of work in the Channel Islands was cut short by more urgent requirements elsewhere. After completing the main Swinge Channel and approaches, leaving a subsidiary area to the north of about a quarter of the total to be completed later, H.M.S. *Shackleton* arrived at Barrow-in-Furness on 11th October where a survey was required on a large scale of the 9-mile channel of shallow water which leads to the Docks from seaward. This area was last completely surveyed in the early years of the century and intense interest in the work was shown by the people of Barrow to whose livelihood the maintenance of the channel is literally vital. An unusually close succession of autumnal gales followed the ship's arrival and much working time was lost from this cause. Fortunately, the weather in the intervals was good, and, encouraged both by the local population and by the proximity of the end of the season, the work was just completed in time to return to Devonport for refit on 3rd November.

Inshore Survey Squadron (*Lieutenant-Commander D. R. Benson, Royal Navy*). After completing the annual refits, the Squadron surveyed three small areas in the Thames Estuary before returning to Chatham to give leave and also to take part in the Nore Command Closing Down Ceremony.

After Easter two of the craft assisted H.M.S. *Scott* with wreck sweeping in the Dover Straits whilst the third was employed in the annual re-survey of the Edinburgh Channels; this work proceeded steadily until the end of May with only minor diversions from the surveying programme — such as trials of a wreck-finding Asdic and of a new glass fibre surveying motor-boat, assisting the Ramsgate lifeboat in succouring a yacht which was in difficulties near the Goodwin Sands and taking a number of boys from a Ramsgate secondary school to sea for the afternoon. The Squadron then sailed westward for an official visit to the Britannia Royal Naval College, Dartmouth, where midshipmen and cadets showed a considerable interest in the Squadron and the Surveying Service.

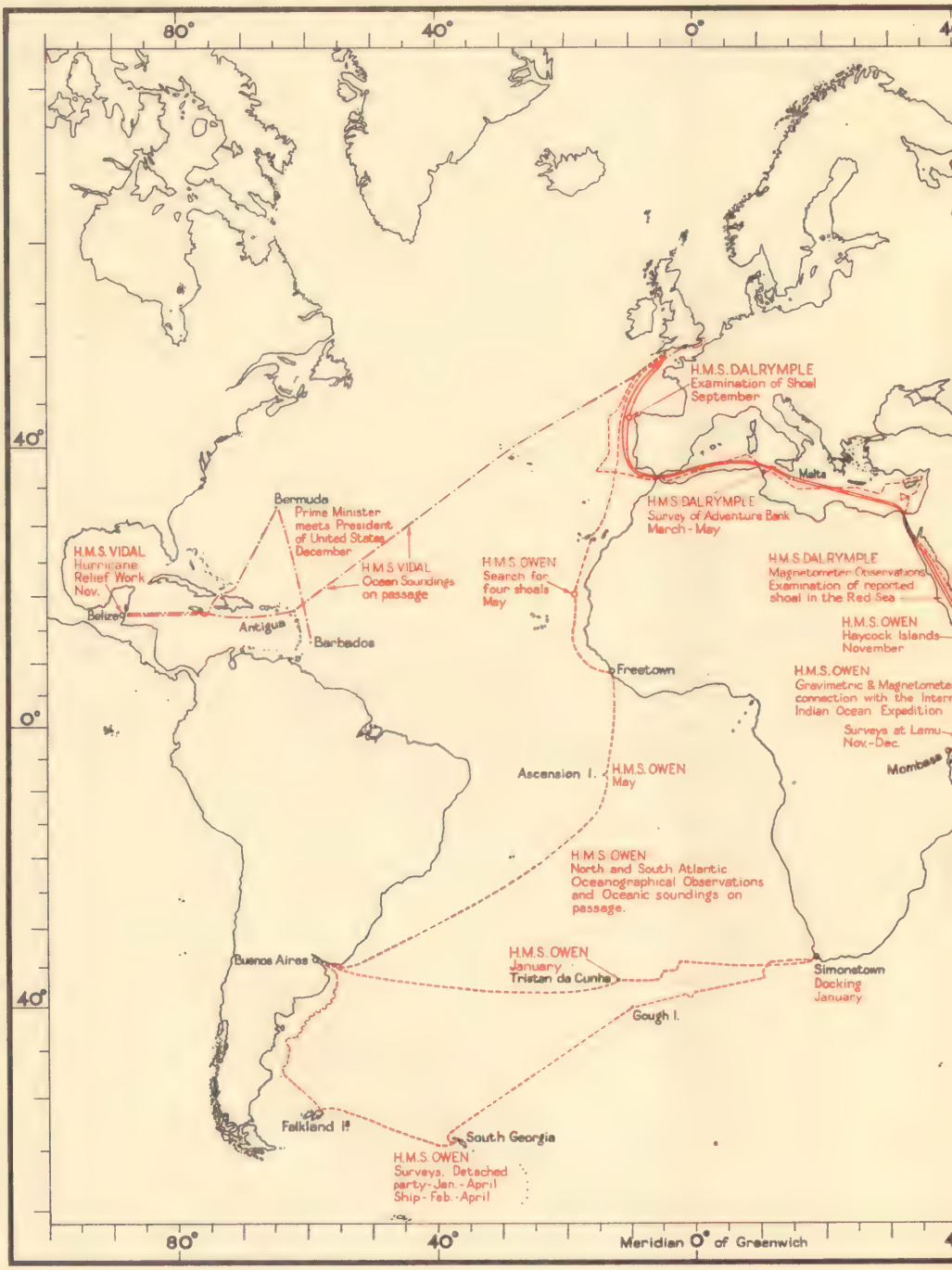
All three ships of the Squadron spent most of June in a survey of Salcombe, returning to the Thames Estuary to take in hand surveys of Barrow Deep (H.M.S. *Echo*), East Cant to Knock John (H.M.S. *Egeria*) and the Outer Queen's Channel (H.M.S. *Enterprise*). H.M.S. *Echo* visited Rochester between 23rd and 25th June to attend the celebrations of the 500th anniversary of the granting of the Mayoralty; in early July H.M.S. *Egeria* was diverted to sweep some obstructions in Harwich Harbour.

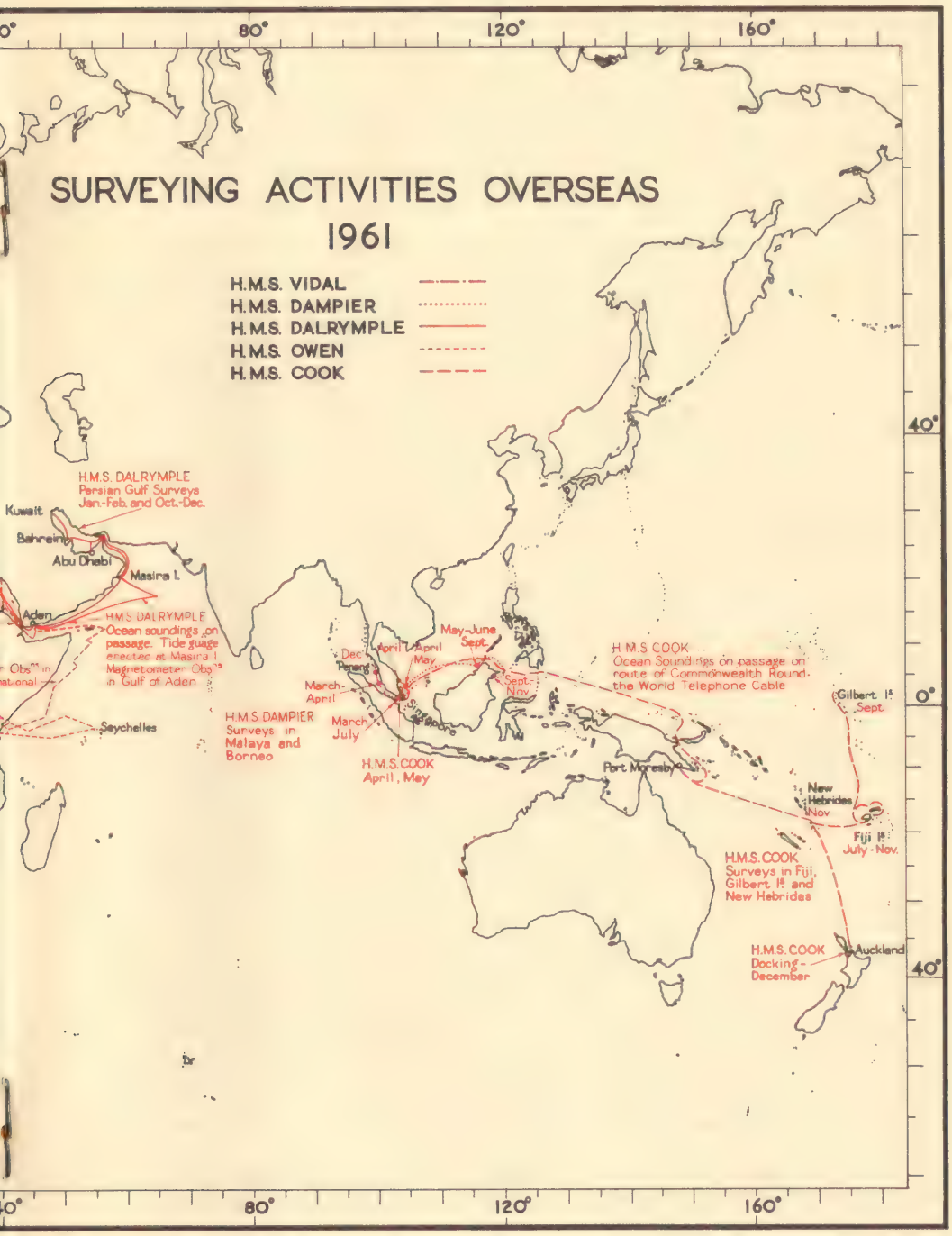
On 19th July the Squadron gathered together again at Ramsgate, where the Hydrographer of the Navy joined to take passage to Chatham. Two days later the Annual Inspection was carried out by the Flag Officer Medway (Rear-Admiral I. W. T. Beloe, D.S.C.).

After the Inspection, H.M.S. *Egeria* and H.M.S. *Enterprise* proceeded to complete the wreck sweeping in the Dover Straits and thence to carry out surveys in Caister Roads, the Approaches to Yarmouth and the Approaches to Lowestoft. H.M.S. *Echo* remained in Chatham, giving summer leave and fitting a new electronic fixing system — "HYDRODIST" — which was subsequently used in a survey of Goldmer Gat.

The remainder of the surveying season was spent in sweeping the wrecks in the main survey areas, in carrying out small surveys at Clacton and Aldeburgh and in some trials of a new oblique Asdic in conjunction with the National Institute of Oceanography, the British Petroleum Research Department and Messrs. Kelvin Hughes. The Squadron returned to Chatham on 17th November, having completed all the surveying work allocated for the season.

South Coast of England Survey (*Lieutenant-Commander J. T. K. Paisley, Royal Navy*). The first two months of the surveying season were spent in surveys at Yarmouth, Isle of Wight, at Portland and Weymouth and in Lyme


80°
40°
0°
40°
0°
40°
80°
40°
Meridian 0° of Greenwich
H.M.S. DALRYMPLE
Examination of Shoal
September
Malta
H.M.S. DALRYMPLE
Survey of Adventure Bank
March - May
H.M.S. DALRYMPLE
Magnetometer Observations
Examination of reported
shoal in the Red Sea
H.M.S. OWEN
Haycock Islands
November
H.M.S. OWEN
Gravimetric & Magnetometer
connection with the Inter
Indian Ocean Expedition
Surveys at Lamu
Nov.-Dec.
Mombasa
Bermuda
Prime Minister
meets President
of United States
December
H.M.S. VIDAL
Ocean Soundings
on passage
H.M.S. VIDAL
Hurricane
Relief Work
Nov.
Belize
Antigua
Barbados
H.M.S. OWEN
Search for
four shoals
May
Freetown
Ascension I.
H.M.S. OWEN
May
H.M.S. OWEN
North and South Atlantic
Oceanographical Observations
and Oceanic soundings on
passage.
Buenos Aires
H.M.S. OWEN
January
Tristan da Cunha
Simonstown
Docking
January
Gough I.
Falkland Is
South Georgia
H.M.S. OWEN
Surveys. Detached
party - Jan. - April
Ship - Feb. - April


SURVEYING ACTIVITIES OVERSEAS
1961
H.M.S. VIDAL
H.M.S. DAMPIER
H.M.S. DALRYMPLE
H.M.S. OWEN
H.M.S. COOK
80°
120°
160°
40°
0°
H.M.S. DALRYMPLE
Persian Gulf Surveys
Jan.-Feb. and Oct.-Dec.
Kuwait
Bahrein
Abu Dhabi
Masira I.
Aden
H.M.S. DALRYMPLE
Ocean soundings on passage. Tide gauge erected at Masira I.
Magnetometer Obs^ns in Gulf of Aden
Seychelles
H.M.S. DAMPIER
Surveys in Malaya and Borneo
March-April
March July
Dec
Penang
April
May
April
May
May-June
Sept.
Sept.-Nov.
Singapore
H.M.S. COOK
April, May
H.M.S. COOK
Ocean Soundings on passage on route of Commonwealth Round the World Telephone Cable
Gilbert Is
Sept.
Port Moresby
New Hebrides
Nov.
Fiji Is
July - Nov.
H.M.S. COOK
Surveys in Fiji, Gilbert Is and New Hebrides
H.M.S. COOK
Docking - December
Auckland

Bay. Tidal stream observations were taken off St. Catherine's Point, which confirmed the existence of rates considerably higher than charted.

The Hydrographer of the Navy visited the unit in April, spending most of one day at sea in H.M.S. *Meda*, and then transferring to the prototype of an 18-foot glass fibre surveying motor-boat in order to gain first-hand experience of this craft.

The next five weeks were spent in the survey of the South Western Approaches to Jersey, an area where many rocky heads had to be located and examined; all of these were dangerous to navigation and few dried out at low water. The great range of the tide here, with its consequent rapid changes in height, was a factor sometimes helpful, sometimes a hindrance, but one to be constantly remembered.

On return to the mainland early in July the unit undertook a re-survey of the Approaches to Exmouth and of the River Exe as far up as Starcross. Here the problem of sounding large areas of shallow water was aggravated by exactly the opposite tidal phenomenon — tides of very low range (only 4 feet at some neaps). These totally different tidal conditions existing less than a hundred miles apart, and the different problems they pose, well illustrate the diversity and interest of hydrographic surveying. This survey was completed in mid-September; during this period a brief digression was made to Alderney to assist H.M.S. *Shackleton*, and Portsmouth was visited to give summer leave.

The area surveyed in Lyme Bay earlier in the season was then extended slightly, and in October and November surveys of Christchurch Bay and Dolphin Bank were progressed and a post-dredging survey of Pot Bank, off the Needles, was carried out. The surveying season ended on 29th November.

H.M.S. MEDUSA (*Lieutenant-Commanders A. C. F. David and J. M. Mackay, Royal Navy*) completed her refit at Devonport in early March. Her first task of the season was to proceed to Cherbourg, where she was joined by H.M.S. *Shackleton*, for a liaison visit with the French Surveying Ship *L'Amiral Mouchez*; needless to say this was a pleasant enough task, highlighted by a visit to the beautiful islet of Mont. St. Michel where officers and ratings were entertained to a sumptuous luncheon. H.M.S. *Medusa* then returned to commence a survey of Bigbury Bay which, together with some triangulation work at Falmouth, was completed by the end of May. During the month the annual inspection was carried out in the course of which a line of soundings was run to show that there was a river bed gouged through the underwater cliff discovered the year before off Plymouth Sound.

The next survey was at Padstow; this was completed in time for the launch to proceed to Pwllheli for a survey of St. Tudwal's Roads and to carry out some seismic work in conjunction with Birmingham University, before returning to Devonport for the mid-seasonal docking and to give summer leave.

At the end of August, H.M.S. *Medusa* proceeded to Falmouth for a survey in which a qualifying class of Surveying Recorders First Class assisted as part of their training. Whilst engaged on this work, H.M.S. *Medusa*, together with H.M.S. *Miner III*, was ordered to search for the wreckage of a helicopter which had been lost (fortunately without loss of life) outside Falmouth Harbour. Within an hour of reaching the scene of the incident, H.M.S. *Medusa* had been conned over an oilslick by a searching helicopter and the wreckage was immediately located by echo-sounder. The next day the helicopter was raised and landed at Falmouth.

The next survey of the season was the continuation of the inner part of the survey of Salcombe which had been started by the Inshore Survey Squadron earlier in the year; however, time did not permit its completion and H.M.S. *Medusa* returned to Devonport for refit and to draw fair charts on 15th November.

Hydrographic Department

The Chart Branch of the Hydrographic Department, which is situated at Cricklewood, compiles and maintains a world-wide series of charts, Sailing Directions, Tide Tables, Light Lists, Radio Lists and other publications and navigational diagrams relating to navigation. These documents are supplied to H.M. Ships and can also be purchased through the appointed Chart Agents.

A large proportion of the world's merchant shipping takes advantage of the coverage given by Admiralty charts and of the service provided through 150 Chart Agents at home and abroad, and the correctional facility given through Admiralty Notices to Mariners.

In British home waters it is the policy to chart all waters used by shipping and craft on a scale sufficient for safe navigation. Overseas, Admiralty charts are schemed to enable ships to traverse the oceans and along the coasts of the world to reach the approaches to ports, using the most appropriate scales. In general, foreign ports are charted on a scale adequate for vessels under pilotage but a number of major ports are charted on larger scales commensurate with their importance or intricacy.

There are upwards of 3,300 charts for navigational purposes and of these the number replaced by new charts or with major revisions amounted to 254 during the year. Decca hyperbolic curves are overprinted on 246 charts and Loran curves on 18. Shallow water blue areas are indicated on 993 out of the total number.

Two new chart series were started during the year, one for yachtsmen and the other for voyage planning purposes; these are described in detail below. It is hoped that these various additions and developments will continue to keep the British Admiralty chart in line with the user's requirements.

Meeting at the Institute of Navigation on the Admiralty Chart

At the suggestion of the Hydrographer of the Navy, a symposium on the Admiralty Chart was arranged by the Institute of Navigation on 17th February, 1962. The meeting took the form of a discussion opened by the Hydrographer, who had with him on the platform the heads of the various branches of the Hydrographic Department. A large audience of merchant service officers and other chart users put questions on charting matters to those on the platform and a very useful exchange of ideas resulted, which was subsequently published in the *Journal of the Institute of Navigation*, Vol. XIV, No. 4.

This was the second meeting on the subject of Admiralty Charts held at the Institute and proved again that this is a convenient way for the Hydrographer to keep in touch with the commercial users of his charts.

Chart Users' Advisory Panel

On this occasion, a suggestion was put forward that a panel of users should be set up to advise the Hydrographer from the commercial users' angle on charting matters affecting them so that charts sold to the merchant fleet meet requirements adequately.

As a result of the suggestion a Chart Users' Advisory Panel was formed during 1961 composed of approximately forty-five shipping companies. Panel members have indicated the areas of the world in which they are primarily interested and it is now current practice for members of the Hydrographer's staff to consult panel members by telephone or letter whenever a particular member's views are likely to be helpful.

Several new chart schemes or layouts, which are usually difficult to arrange to every mariner's satisfaction, have been submitted to groups of panel members interested in the areas concerned for their advice before compilation is put in hand. Constructive advice has been regularly received in this way during the latter half of 1961.

Routeing Charts

One of the main questions discussed by members of the Chart Users' Advisory Panel during the latter part of 1961 was the mariner's need for composite "routeing charts" for voyage planning purposes. Such a chart, on a small scale covering one ocean, would combine on one sheet the great circle tracks between major ports, prevailing wind, weather and current information and the seasonal load-line zones. This is a particular requirement for tankers but it now seems that many dry cargo ship operators may be interested.

A modest start was made at the end of 1961 to put in hand for publication four of these monthly charts spaced at quarterly intervals and covering the North Atlantic in the first instance.

Charts for Yachtsmen

The growing number of yachtsmen in the United Kingdom, with their special requirements for charts, led the Hydrographer to approach the Royal Yachting Association for advice on the type of chart required. A small committee of the R.Y.A. met the Hydrographer on two occasions in 1961 and from advice obtained at these meetings he has been able to develop a new type of port or harbour chart, printed on foolscap size paper, designed specially for the yachtsman.

Seven of these charts of minor ports in and around the Thames Estuary were available through Admiralty Chart Agents by the end of the year and a scheme of similar charts for minor ports on the south coast of England is now in hand.

Radio Navigational Warnings

The first public notification of Radio Navigational Warnings was made by Notice to Mariners in 1920. In the United Kingdom, Poldhu (Land's End) and Cleethorpes were the only stations used for broadcasting Navigational Warnings at that time.

In 1922 the G.P.O. Coast Radio Stations were brought into the Navigational Warning System, which enabled Admiralty to issue Navigational Warnings directly through the Coast Stations. Trinity House and certain of the larger Harbour Authorities were also allowed to issue Navigational Warnings through the appropriate Coast Stations for their areas of jurisdiction.

Between the two World Wars the number of Radio Navigational Warnings issued was very small. At the outbreak of World War II, however, all plain language broadcasts to ships ceased and the control of all messages which had to be passed to shipping was vested in the Admiralty.

During the war the Hydrographer was responsible for issuing allied navigational warnings in the Home Area. As a result of war experience it was felt that there would be a place for radio navigational warnings to shipping in peacetime. Thus at the end of the war in 1945 the Navigational Warnings staff was drastically reduced, but a nucleus was retained to issue peacetime navigational warnings called NAVEAMs (*NAV*igational Warnings *E*astern *A*tlantic and *M*editerranean). These messages are broadcast from Portishead Radio on 1st, 2nd, 5th, 8th and 12th days after originating thus ensuring that every ship has a good chance of receiving them. In 1950 the area covered by NAVEAMs was extended to the southern end of the Red Sea.

In addition to the Long Range Warnings issued as NAVEAMs, incidents of importance to shipping in U.K. Waters are broadcast through G.P.O. Coast Radio Stations. All information which is likely to form the subject of a radio warning to shipping is passed to the Navigational Warning Section in the Admiralty, who sift the information and issue the warnings as necessary. These messages are only broadcast from the Coast Stations covering the area affected and are known as WZ Messages in H.M. Ships, but to Merchant Shipping they are not serially numbered and are indistinguishable from any other warnings

broadcast by local Coast Stations. Certain Harbour Boards and Conservancy Boards also have authority to issue radio warnings of local importance only through the local coast station. Such information is always reported to Admiralty and no duplication takes place.

The Navigational Warning Section also acts as Co-ordinator for the Commonwealth Radio Warning System ("W" Messages), of which NAVEAM forms a part. WC and WP Messages covering the Indian Ocean and the China Sea respectively are run by the Royal Navy from Singapore, while WF and WM Messages are issued by the Royal Australian Navy and Royal New Zealand Navy for their respective areas.

WU Messages for the South Atlantic Area are originated by the South African Navy, and although South Africa is no longer a member of the British Commonwealth this service is still continuing.

The British Commonwealth "W" Messages Radio Warning Organisation together with the American "Hydrolant" and "Hydropac" Systems provide a world-wide coverage of radio warnings, and it is the duty of the Navigational Warning Section to see that all important messages in force are reprinted weekly in Admiralty Notices to Mariners for the benefit of those who have not received them by radio.

The Hydrographer's Navigational Warning Section is also the Executive for the International Routeing and Reporting Authority (I.R.R.A.), responsible for promulgating information regarding mined areas and routes. This information is published in NEMEDRI (*N*orthern *E*urope and *MED*iterranean *R*oute *I*nstructions). During the course of the year this publication has been completely rewritten and was generally available in January, 1962.

The Hydrographic Department publishes an annual Notice to Mariners (No. 18) giving details of mine dangers elsewhere in the world. The compilation of this Notice together with the weekly correction thereto are the responsibility of the Navigational Warning Section. This year a great improvement has been made in portraying the complicated maze of swept areas in the Japanese Inland Sea, by providing over-printed versions of three charts covering this area. These charts, which have been placed on sale, should greatly facilitate the mariners' task of identifying and plotting the numerous swept areas and channels in the Inland Sea.

The staff of the Navigational Warning Section consists of two Naval Officers (H), one Chart Depot Assistant, who keeps a world-wide set of charts fully corrected for Notices, radio warnings and all mine danger information, and one clerk, who keeps all the navigational publications fully corrected as well as general clerical duties in connection with the Section as a whole.

Oceanography

All Surveying Ships have spent a proportion of their time on oceanographical work during the year.

In Home Waters, H.M.S. *Shackleton* carried out gravimetric and magnetic observations in the Irish Sea in co-operation with Durham University and, whilst working in the Bristol Channel, some bottom samples and cores were also collected by her on behalf of Bristol University. Also in the same waters, H.M.S. *Medusa* embarked a team from Birmingham University to carry out seismographic investigation in Cardigan Bay.

In the North Sea, the National Institute of Oceanography has been investigating a particularly interesting series of sand waves and H.M.S. *Scott* has been able to assist whilst carrying out a survey of the area.

Abroad, H.M.S. *Owen* continued her cruise from South Georgia to the United Kingdom via Montevideo, Freetown and the Canary Islands, during which scientists were carried from the British Museum (Natural History), the National Institute of Oceanography and the Imperial College of Science and

Technology. The greater part of the work was geological in nature and a large number of cores and bottom samples were obtained. A series of surface and deep water samples were also collected for a world-wide survey of salinity conditions being undertaken at the National Institute of Oceanography.

In June, a traditional job of the Surveying Service was revived when H.M.S. *Cook* assisted in the investigation of part of the route for the Commonwealth Round-the-World telephone cable, between North Borneo, Port Moresby and Fiji.

Towards the end of the year, H.M. Ships *Owen* and *Dalrymple* sailed from Devonport to their survey areas, the Indian Ocean and the Persian Gulf respectively. Both ships towed proton magnetometers for their passages and H.M.S. *Dalrymple* also carried a party from the Imperial College, who plan to work off the Trucial Coast. H.M.S. *Owen* was fitted with an Askania gravimeter during her refit and has been running both instruments, together with a Precision Echo-Sounder as part of the United Kingdom contribution to the International Indian Ocean Expedition. Scientists from the Department of Geodesy and Geophysics, Cambridge, are participating in this work.

It is intended, in future, to publish the raw data and outline results of oceanographic work carried out by H.M. Surveying Ships and also the Ocean Weather Ships.

The Hydrographer personally attended the annual meeting of the International Council for the Exploration of the Sea in Copenhagen this year and was accompanied by the Deputy Superintendent of the Oceanographical Branch who also attended the first meeting of the Intergovernmental Oceanographic Commission in Paris in October. It is hoped that the Commission will play a vital role in International Oceanography in years to come. As a direct result of the inaugural meeting, the Hydrographic Department has been designated as the United Kingdom oceanographic data centre and the full implications of this are being explored with the Ministry of Agriculture, Fisheries and Food.

There has been an increase during the year in the number of requests for Bathythermograph data and these are becoming of increasing importance, particularly observations taken with 900 feet instruments.

An index of the 1/1 Million series of Oceanic Plotting Sheets, showing the coverage of deep soundings held in the Department, has been issued and will be reissued at appropriate intervals. In addition, a new 1/Quarter Million scale series of sheets, covering latitudes 0°–66°, have been published to supplement the existing small-scale series. These sheets are already being used by the Cable Companies for their work on the Commonwealth Round-the-World cable.

The Tidal Branch

During the year new automatic tide gauges have been installed at Portsmouth, Devonport, Portland and Gibraltar, and data obtained from these gauges are now being studied. In connection with the establishment of the Gibraltar gauge an important piece of work was carried out with the co-operation of the Directorate of Overseas Surveys and the Ordnance Survey in conjunction with officers of the Instituto Geografico y Catastral de Madrid. This work consisted of connecting the levelling system of Gibraltar to that of the Spanish mainland and hence to the European Levelling Network, a connection which had never previously been made, and was a very successful example of inter-service and international co-operation.

The tidal survey of the British Isles continued with detailed observations lasting for a month at selected sites between Devonport and Penzance. In spite of a severe storm which damaged several of the gauges, excellent results were obtained.

Work has been put in hand in connection with establishment of tidal stations for the Indian Ocean oceanographical expedition. An automatic tide gauge was

required at Masira, off the Arabian Coast, and has now been erected on a special structure off-shore, prefabricated in Devonport Dockyard. This, the first of its kind to be constructed for a Surveying Ship, has proved completely successful and records from this gauge are now reaching the Department.

Admiralty Tide Tables for 1962 have now been printed in a larger format for easier reading and are now uniform in size with the Nautical Almanac.

Investigations have been made into the possible use of electronic computers for tidal analysis and prediction. An international conference on this subject was held in Paris in November and was attended by a representative of the Department.

Admiralty List of Lights

A general overhaul of the twelve volumes of List of Lights was begun in 1959 in preparation for a new printing contract which came into force in the spring of this year. The format and layout have been altered, and the detailed descriptions of lights are now presented in the same sequence as on charts.

Many new and complicated types of navigational lights are now coming into use, and to explain these to seamen the introduction to the List of Lights has been reschemed and diagrams of the various characters are included.

Despite the greatly increased number of lights now listed there will be an overall saving in the number of pages, but increases in printing costs have necessitated an increase in the selling prices of these volumes.

Four volumes of the new series have already been published, and these have been well received and recognised as an improvement.

Three thousand two hundred corrections to the List of Lights have been promulgated by Section III of the Notices to Mariners during the year.

HYDROGRAPHIC SUPPLIES ESTABLISHMENT, TAUNTON

The primary commitment of the preparation, printing and issue of charts and navigational publications to the Fleet and for sale to Merchant Shipping and Fishing Fleets, has again been satisfactorily fulfilled against a background of the increasing number of Decca latticed charts and a greater overall demand for charts.

Following the all-time record figures in 1960, an even higher level of the sale of charts was attained this year, 1,429,819 charts being sold at a nett value of £398,970. In addition, 163,517 navigational publications realised £98,399 and a sale of surplus navigational timepieces brought in over £16,000.

The rise and changing pattern of chart sales have necessitated greater attention to advertisement and market research. During the year, an increased number of visits to agencies in the United Kingdom was made and yachting centres were visited with a view to the establishment of local retail arrangements for a new series of yachting charts, the first of which was published in December for sale at the National Boat Show in January, 1962. Agencies in the Netherlands and Belgium were visited in July and some in Germany in August, particular attention being devoted to chart correction arrangements.

Production Division has, throughout the year, consistently met all demands placed upon it for charts and for repayment work for H.M. Stationery Office and other Government Departments. The first step has been taken for the gradual replacement of presses which have been in constant use for over twenty years. The introduction of mechanised costing early in 1961 has proved successful. In the realm of Work Study the team has been employed on projects connected with Production Division and completed three projects which, when effected, will lead to greater efficiency.

As a result of the successful broadcasts on sound and television in 1960 a further broadcast describing the work of the Establishment was made on the

B.B.C. General Overseas Service in January. Throughout the year visits were made by officers of the Royal Navy undergoing navigational courses, midshipmen, hydrographic surveying recorders and also officers from foreign Hydrographic Offices. In December, the Commander-in-Chief, Plymouth, Admiral Sir Charles Madden, Bt., K.C.B., visited the Establishment.

Chart Depots

Admiralty Chart Depots, which are under the control of the Superintendent of Issues, Taunton, are situated at Plymouth, Portsmouth, Rosyth, Gibraltar, Malta and Singapore. Stocks of charts, hydrographic and meteorological publications and navigational timepieces are held and maintained to meet the needs of the Royal Navy within each Command.

The depots at Gibraltar and Malta also serve as Admiralty Chart Agents to supply the requirements of Merchant Shipping although all depots provide this service if necessary.

Each depot is staffed by a Chart Supply Officer, with a Senior Chart Depot Assistant as his deputy, and locally entered Chart Depot Assistants. In connection with their supplies and services to H.M. Ships, much of their time is spent on correcting up-to-date all charts, whether from stock or returned by H.M. Ships, from Admiralty Notices to Mariners so that they are at all times available for issue to ships at short notice. Navigational timepieces are similarly maintained and rated for accuracy. Strict stock control is, of course, necessary to ensure that sufficient supplies of all items are on hand and very close liaison and accounting therefore exists between the depots and the Hydrographic Supplies Establishment, Taunton.

Chart Depot representatives are also located at the Imperial Defence College, the Britannia Royal Naval College, Dartmouth, and on the staff of Commander-in-Chief, Far East Station.

THE NATIONAL FLOOD WARNING ORGANISATION

This organisation has continued its work of giving warning of extraordinary rises in the level of the sea at high tide. Thirty-four "Amber Alerts", giving warning of a tide likely to reach the danger level, and 8 "Red Alerts" giving warning of one likely to exceed this level, were issued during the year. Thirteen of the amber alerts were cancelled before high tide and in fact the danger level was reached 8 times (comparative figures for 1960 were: 20 amber alerts, 10 cancelled, 2 red alerts, danger level reached 3 times).

In addition, 15 warnings were given of onshore gales at or near the time of high water, which could cause damage to coast defences.

Storm Surges during 1961

The past year has seen sea level more disturbed by storm surges of greater magnitude than during the last few years. Eighteen storm surges raised sea level more than 2 feet above its predicted level during the year (as compared with 9 in 1960); of these, 9 had a maximum height of more than 3 feet (1 in 1960). Danger level was reached in 7 coastal divisions (3 in 1960).

On 20th March during the spring tides, the northerly gale behind a vigorous depression moving down the Norwegian Coast caused the highest sea levels on our East Coast since the floods of 1953. The sea rose above danger level from the Humber to the Thames Estuary, by amounts varying from 1 foot at Immingham to over 2 feet at Harwich. Livestock perished and damage was caused to boats in the Humber and Wash areas, but slight damage to boats was reported further south, with some flooding. The greatest rise in sea level occurred at Tilbury where a level of 7·3 feet above the predicted height was reported.

FIG. 4—Correction of charts at Admiralty Chart Depot, Plymouth

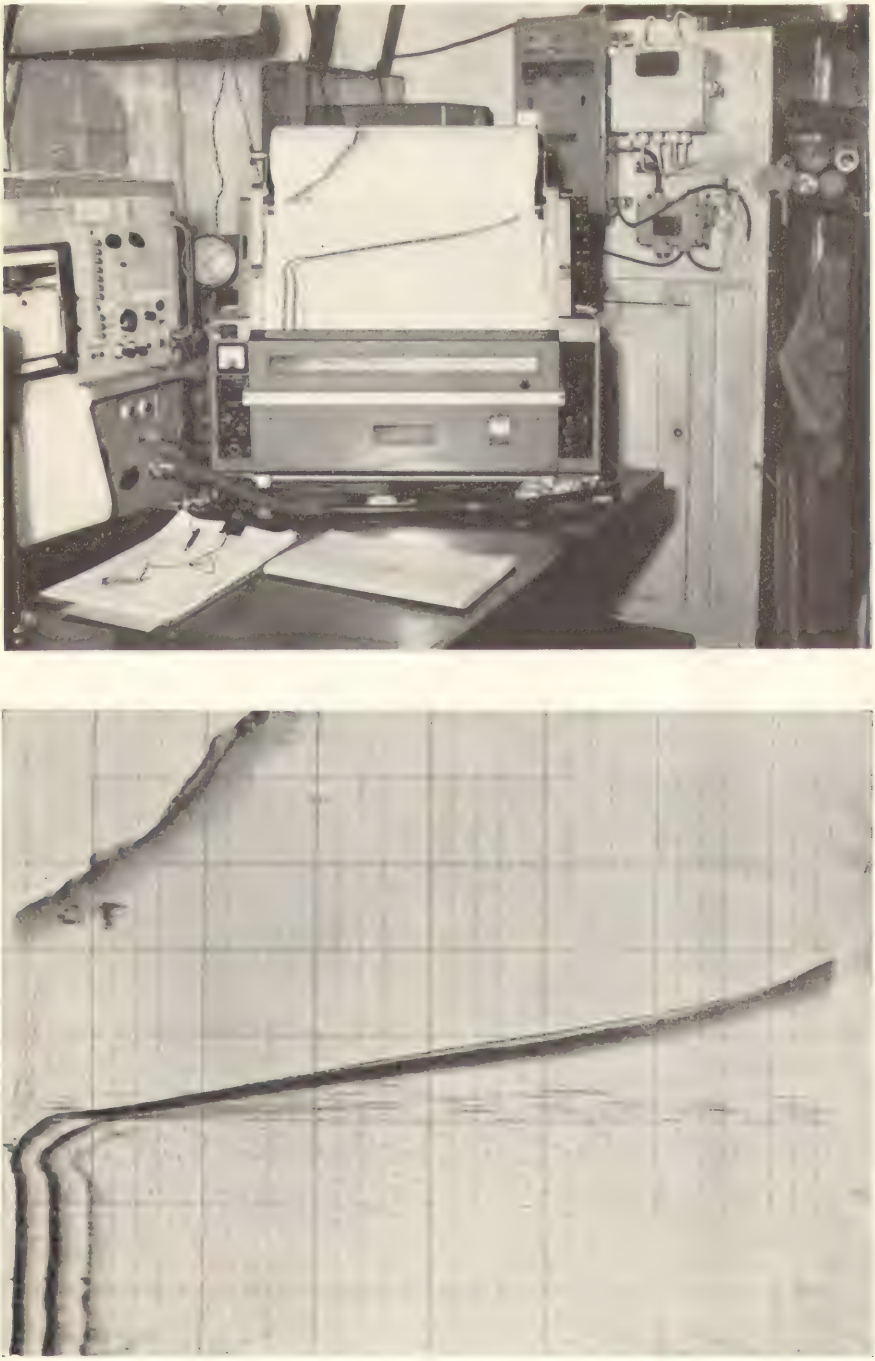


FIG. 5–H.M.S. *Owen*–Precision Depth Recorder and sections of a P.D.R. trace

Fortunately, this maximum surge height occurred about three hours before high water at Tilbury. Had the surge peak arrived at high water, the level there would have been 1½ feet higher than that reached in 1953 and serious flooding must have resulted.

The Organisation

On 30th September the Flood Warning Organisation, in company with Forecast Division, moved to the large new Meteorological Office headquarters at Bracknell, Berkshire.

When the Waverley Committee recommended the setting up of the Flood Warning Organisation after the disastrous floods of 1953, it laid down that it should operate from 15th September to 30th April each year because past records indicated that the dangerous combination of northerly gales in the North Sea with high spring tides did not occur during the summer months. In fact, because of high spring tides in late August, the Organisation has often started operations earlier; but this year in early July a northerly gale sprung up at spring tides and danger level was reached at Lowestoft and almost reached at Harwich. In view of this, statistics are being re-examined to see whether the Organisation should remain operational throughout the year.

The question of installing distant reading recorders from tide gauges is being examined; with these, tide readings at, say, Aberdeen or Immingham would be instantly available on dials at the offices at Bracknell, enabling warnings to be issued earlier and with greater accuracy.

It has also been found that most of the storm surges which enter the North Sea from the Atlantic can be detected at Stornoway some six hours before passing Aberdeen on their way down the east coast; thus the inclusion of Stornoway as a tidal reporting station, effected in December, should lead to an improvement in the accuracy of flood warnings. Slight changes made in the communications arrangements between the Flood Warning Organisation and the Police and River Boards should also help to speed the issue of warnings.

The installation of the new tide gauges on the north and west coasts of Scotland, mentioned in the last Annual Report, and whose records would be most useful for investigating the behaviour of these surges from the Atlantic, is still held up by administrative difficulties.

Other Work

Work continues on the computation of Mean Sea Level heights at various ports and on the tabulation of accurate tidal and meteorological data of large surges. Visits were paid to seven of the key ports where tide gauges are situated which supply data for use in surge research.

The renewed interest shown lately by the Government in the Thames Barrier project has involved the Flood Warning Organisation in collaboration with a new committee formed to investigate this matter.

In the spring the public was given a brief glimpse of the Organisation at work when a documentary film in the "Look at Life" series, entitled "Coast Defence", was shown in some cinemas.

International Co-operation

As in previous years copies of the special hourly tidal predictions used in forecasting storm surges were supplied to the Flood Warning Organisations of Holland and Germany. The hourly tidal heights sent in from our coast ports were also retransmitted to them via the Meteorological Office network used in exchanging weather information. Data regarding storm surges on the east coast of England have also been sent to research workers in countries bordering the North Sea.

Name of H.M. Ship	Officer-in-Charge of Survey	Assistant Surveyors	Total Complement	Displacement	Survey
Vidal	Captain C. R. K. Roe, D.S.C., R.N.	5	171	1,940	West Indies
Dampier	Cdr. J. D. Winstanley, R.N.	4	155	1,600	Malaya—Borneo
Dalrymple	Acting Cdr. M. J. Baker, R.N., and Cdr. H. R. Hatfield, R.N.	4	140	1,600	Mediterranean—Persian Gulf
Owen	Cdr. G. P. D. Hall, D.S.C., R.N.	5–6	142	1,600	South Georgia—East Africa Oceanographical Surveys in N. and S. Atlantic and Indian Oceans
Cook	Cdr. J. Paton, R.N.	5–6	159	1,600	Malaya—South Pacific
Scott	Lt.-Cdr. W. J. M. Roberts, R.N.	4	108	815	England—East Coast
Shackleton	Lt.-Cdr. R. A. G. Nesbitt, R.N.	3–4	102	815	England and Scotland, West Coast, Channel Islands
Inshore Survey Squadron	Lt.-Cdr. D. R. Benson, R.N.	2	54		England—South and East Coasts
Echo				160	
Egeria				160	
Enterprise				160	
South Coast of England Survey	Lt.-Cdr. J. T. K. Paisley, R.N.	2	11		England—South Coast, Channel Islands
Meda				72 ft. M.L.	
Medusa	Lt.-Cdrs. A. C. F. David, R.N., and J. M. Mackay, R.N.	—	10	72 ft. M.L.	England—South and West Coasts, Wales

Surveying Service

Coastline Surveyed (miles)			Area Surveyed (square miles)			Remarks
Scale over 1/12,500	Scale 1/12,500 to 1/50,000	Scale below 1/50,000	Scale over 1/12,500	Scale 1/12,500 to 1/50,000	Scale below 1/50,000	
1	—	—	—	3	—	Ship recommissioned after long refit in September, 1961. Surveys by small detached parties only; ship employed on hurricane relief and guard ship for Prime Minister's meeting with the President of the United States.
30	67	35	40	365	1,508	Malaya—Perak River and Approaches, Western Approaches to Penang, Western Approaches to Singapore, Submarine Exercise Area North-east of Pulao Aur. Borneo — Pulau Silad to Usukau Bay, Usukan Bay, Darvel Bay. Tidal and Tidal Streams observations were obtained in several localities, and five wrecks were swept for least depth in the Singapore area.
—	—	—	2	4	2,426	Mediterranean—Adventure Bank. Persian Gulf—Straits of Hormuz, Abu Dhabi Approaches. In addition minor surveys have been completed in Malta, Masira and Bahrain, soundings have been taken continuously whilst on passage. An automatic tide gauge was erected at Masira.
5	254·5	659	5	67·5	7	South Georgia—North-west coast, Stewart Strait, Bird Sound, Elsehul and the Undine Harbours. East Africa — Lamu Harbour and Approaches, Lamu Manda and Patta Bays. Minor surveys were undertaken at Tristan da Cunha, Ascension Island and the Haycock Islands (in the Red Sea), and several oceanic shoals were surveyed. Several sets of Tidal and Tidal Streams observations were taken and a large amount of oceanographical work was achieved.
2·5	68	68	1	99	806	Malaya—Sibu Channel to Jason Bay, South Pacific: Fiji — Langa Langa River to Tilangitha Pass, Sau Sau Passage to Ringgold Channel, Tasman Strait, Savu Savu Bay: Gilbert Islands — Abaiang: New Hebrides — Vila Harbour. In addition many miles of ocean soundings were taken whilst on passage. Numerous Tidal observations were obtained in several localities.
—	—	—	—	39	1,085	Main Surveys—Entrance to the River Humber, North-east Approaches to the Wash, Southern North Sea. In addition wreck surveys were undertaken in the Straits of Dover and off the Suffolk and Norfolk coasts: 101 wrecks were swept for least depth, plus another 7 in the main survey areas; the existence of a further 22 wrecks was disproved.
6	28	28	5	57	260	Main Surveys—Mevagissey, Bristol Channel — Watchet to Hinkley Point. Scotland — Approaches to the Firth of Lorne, Approaches to Oronsay. Channel Islands, Alderney — The Swinge. England, West Coast — Barrow Channel. Tidal and Tidal Streams observations were taken in several localities. Eight wrecks were swept for least depth. A geological survey in the South-western Approaches to U.K. was undertaken.
5	—	—	24	138	—	Main Surveys—Thames Estuary — Edinburgh Channels, Knock John, Knob Channel, West Oaze, East Cant to Knock John, Barrow Deep, Outer Queen's Channel, Goldmer Gat. East Coast — Lowestoft, Caister Road, Yarmouth. South Coast — Salcombe. Seventy wrecks or obstructions were swept for least depth.
7·5	—	—	14	—	—	Main Surveys—Yarmouth (I.O.W.), Bexington, South-western Approaches to Jersey, Exmouth. Two wrecks were swept for least depth, and one set of Tidal Streams observations taken. Four minor surveys were completed.
17	—	—	17	50	—	Main Surveys—St. Just Pool to Turnaware Point, Falmouth Harbour Entrance, Bigbury Bay, St. Tudwal's Roads, Padstow Bay. Five minor surveys were completed.

APPENDIX II

Work received in the Hydrographic Department from sources other than H.M. Surveying Ships, 1961

Useful and important information relating to all parts of the world has been received from the Hydrographic Departments of Foreign Governments, by the free exchange, in accordance with custom, of new charts and other documents of hydrographic interest.

Of the Foreign Government charts received during the year, 276 were new charts and 1,058 revised editions. These totals include charts received from Commonwealth Countries.

Various plans, maps and surveys and other information have been supplied by Port and Harbour Authorities, British Consuls, the War Office, Overseas Survey and Ordnance Survey.

Much information, such as plans and sketches, additional soundings and other reports of hydrographic interest, has been received from the officers of H.M. Ships and of the Merchant Navy, and from Yachtsmen. Such reports constitute a most valuable source of information, particularly in the less frequented parts of the world.

Documents most worthy of mention received during 1961 from other sources are as follows:—

GENERAL LOCALITY	PLACE OR AREA SURVEYED	BY WHOM SURVEYED
Great Britain	Entrance to the River Tyne	Tyne Improvement Commission
	Lloyd's Station to Willington Quay, River Tyne	
	Seaham Harbour Entrance	Seaham Harbour Master
	Hartlepool Bay	S. M. Tidy (Public Services) Ltd., Brighton
	Stallingborough Haven to Barton Haven, River Humber	Humber Conservancy Board
	Oil Jetties, Salt End, River Humber	British Transport Commission
	Approaches to King's Lynn, The Wash	Great Ouse River Board
	Lowestoft Harbour Entrance to Mutford Lock	Eastern Region, British Railways
	River Thames—Sea Reach	
	Coalhouse Point to Port of London Isolation Hospital	
	Port of London Isolation Hospital to Tilbury Landing Stage	
	Tilbury Landing Stage	
	Coldharbour Point to Jenningtree Point	
	Jenningtree Point to Cross Ness	
	Rainham Creek	
	Chiswick Ferry to Barnes Railway Bridge	Port of London Authority
	Barnes Railway Bridge to Kingston Creek	
	Kingston Creek to Kew Bridge	
	Kew Bridge to Brentford Dock	
	Brentford Quay to Church Ferry	
	Church Ferry to Richmond Lock	
	Richmond Lock to Petersham Ait	
	Petersham Ait to Cross Deep	
	Cross Deep to Teddington Locks	

Appendix II (Contd.)

GENERAL LOCALITY	PLACE OR AREA SURVEYED	BY WHOM SURVEYED
	Approaches to Sheerness	Kelvin & Hughes (Marine) Ltd.
	Bridge Reach, Rochester	
	Otterham Creek	Medway Conservancy Board
	Cornwallis Jetty, Sheerness	
	Dover—Outer and Inner Harbours	Dover Harbour Board
	Newhaven Harbour	Harbour Master, Newhaven
	Bramble Bank, The Solent	
	Nab Tower Area	Southampton Harbour Board
	Royal Pier to Redbridge, River Test	
	King Road, Bristol	Haven Master, Bristol
	Newport Deep	Kelvin & Hughes (Marine) Ltd.
	Milford Haven, Esso Jetty	S. M. Tidy (Public Services) Ltd., Brighton
	Portmadoc	British Railways
	Holyhead Harbour	Mersey Docks & Harbour Board
	River Mersey—Rock Lighthouse to Eastham and Garston	
	Heysham Lake	British Transport Commission
	Lerwick Harbour, Shetland Isles	
	Blackness Pier, Scalloway, Shetland Isles	Ministry of Transport
Ireland	Channel depths, Sligo Bay	Commissioners of Irish Lights, Dublin
	River Barrow, Waterford Harbour	New Ross Harbour Commissioners
Africa, north coast ..	Marsa el Brega	Esso Standard Libya Inc.
Africa, west coast ..	Ferry Terminals, Freetown, Sierra Leone	Coode & Partners, London
	Port of Tema, Ghana	Harbour Master, Tema, and Sir Wm. Halcrow & Partners
	Lagos Harbour and Eastern Approaches to Lagos	
	Ogidigbe to Rugged Point, Escravos River	
	Escravos Mole and Bar	Nigerian Ports Authority (Lt.-Cdr. R. K. Husband, R.N.)
	Forcados Bar	
	Bonny to Dawes Island	
	Bimbia Bars	
	Approaches to Rio del Rey	
	Opobo Bar	
	Dredged Channels, Bonny Bar and River	Shell Tankers Ltd.
Africa, south coast ..	East London Harbour	South African Railways and Harbour Board
Africa, east coast ..	Port of Berbera	
	Port Sudan, Main Quay Extension	Coode & Partners, London
Indian Ocean	Harbour Developments, Port Louis, Mauritius	
	Flying Fish Cove, Christmas Island	British Phosphate Commissioners
Persian Gulf	Manifa Bay	Persian Gulf Lighting Service
	Stiffe Bank	
	Sitra to Al Hamlah	Iraq Petroleum Co.
	Trucial Coast Survey	Kelvin & Hughes (Marine) Ltd.
	Port of Um Qasr	Coode & Partners, London
	Island of Das	British Petroleum Co.
	Kharg Port	Iranian Oil Services Ltd.
Pakistan	Approaches to Kandla	Deputy Conservator, Kandla Port
	Kala Dara Shoal and Kandla Bar	
	Karachi Harbour	Karachi Port Trust
Burma	Buoyage and Coastline, Moulmein River	Port Officer, Moulmein
	Soundings and Moorings Inner Harbour, Rangoon	Port Surveyor, Rangoon
	Rangoon River and Approaches	

Appendix II (Contd.)

GENERAL LOCALITY	PLACE OR AREA SURVEYED	BY WHOM SURVEYED
Malaya..	Approaches to Jurong River	
	Sungei Jurong to Pulau Samulun	Marine Department, Singapore
	Selat Pulau Damar	
	Selat Samulun	
	Approaches to Sungei Kuantan	Marine H.Q. Federation of Malaya
Borneo..	Tanjong Mani Anchorage	
	Semporna	Sarawak Marine Department (Cdr. D. N. Penfold, R.N.)
	Lahad Datu	
Fiji Islands	Lautoka Anchorage, Viti Levu	Harbour Master, Suva, Fiji
China	Southern Fairway, Hong Kong	
	Repulse Bay	Public Works Department, Hong Kong
	Kwan Tong	
	Reclamation Works, Hong Kong	
	Port Works and Developments, Hong Kong	Port Works Officer, Hong Kong
Australia	Townsville Harbour	
	Townsville Harbour and Platypus Channel	Townsville Harbour Board
	New Wharf, etc., Wyndham	Public Works Department, Western Australia
West Indies	Road Town Jetty, Tortola Island	
	St. George's Pier, St. George's Harbour, Grenada	Coode & Partners, London
	Deep Water Harbour, Bridgetown, Barbados	
	Deep Water Harbour, Bridgetown, Barbados	Harbour Master, Bridgetown, Barbados

APPENDIX III

Summary of Charts, Notices to Mariners, and Books published by the Hydrographic Department

	1958	1959	1960	1961
New charts for general purposes	83	91	103	74
New charts and diagrams for use of H.M. Ships	1	3	2	1
New charts and diagrams for special purposes	64	31	34	77
New editions of charts for general purposes	40	42	59	67
New editions of charts for use of H.M. Ships	2	—	2	2
New editions of charts and diagrams for special purposes	135	148	144	107
Large corrections to chart plates	100	93	136	143
Other important corrections to chart plates	88	74	59	51
Small corrections to chart plates	5,646	5,812	6,218	5,267
Blocks produced for Notices to Mariners	278	270	243	237
Admiralty Notices to Mariners	3,032	3,208	3,208	2,802
Notices to Mariners for use of H.M. Ships	120	133	124	129
Navigational Warnings by Radio	720	699	597	652
Revised Volumes of Sailing Directions	4	6	6	9
Supplements to Sailing Directions	27	21	25	18
Revised Volumes of Admiralty List of Lights	10	5	7	6
Air Charts	18	7	10	23
New Editions of Air Charts	58	132	77	93
Air Operational Charts	1	—	—	—
New Editions of Air Operational Charts	—	1	—	—
Air Notices	125	249	159	232

Issues of Charts and Navigational Books

	1958	1959	1960	1961
Charts printed	2,113,040	1,900,243	2,166,678	2,210,393
Charts issued to R.N. and Government Departments	562,015	659,105	547,543	620,158
Charts sold	1,292,572	1,215,276	1,410,094	1,429,819
Books sold	154,486	151,703	151,281	163,517
Value of: Charts sold	£359,506	£338,434	£381,513	£398,970
Books sold	£82,897	£79,786	£84,826	£98,399

C.B.H. 2154 - Wt. 67783 - Dd. H.0338 - 600 - 7/62

CHART FOR YACHTSMEN

Not corrected by Notices to Mariners

APPROACHES TO HARWICH
WITH THE RIVERS
STOUR, ORWELL AND DEBEN

SOUNDINGS IN FEET
(reduced approximately to Lowest Low Water.)

..... 6ft depth contour .....
.. .. 12ft „ „ .. ..
... ... 18ft „ „ ... ...

Natural Scale 1/50,000

M.H.W.S. 12·6ft	M.L.W.S. 1·1ft

ROYAL HARWICH Y.C. · PINMILL · Chelmondiston · RIVER ORWELL · Collimer Pt · Fagbury Pt · Shotley Pt · Harkstead Pt · Erwarton Ness · Erwarton Bay · RIVER STOUR · Copperas Bay · Parkeston · HARWICH · Dovercourt · The Guard · Spire · Quay · Water Tr · Mast · Trinity Ho · Landguard Pt · FELIXSTOWE · Felixstowe Dock · Spire · Martello Tr · Pulpit Rk · Cobbolds Pt · RIVER DEBEN · Felixstowe Ferry · Martello Tr · Bawdsey Manor · Radio Trs (371) · Mast (271) · Horse Sand · Woodbridge Haven · Cork · Cork Spit · Platters · Landguard Pt

Var^n 6°50'W.(1964) decreasing about 6' annually

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SAILING DIRECTIONS

HARWICH.—The approach is deep and well buoyed. Enter from *CORK* light-vessel, passing southward of the obstructions off Landguard point. It is advisable to keep to the recognised channels. *Anchor* clear of the fairway, cross-Channel steamer routes, harbour ferries and submarine cables. According to wind, anchor one cable south-west of Guard buoy, off Felixstowe Dock, or off Shotley pier. In strong winds, anchor off Pinmill in River Orwell. *Landings.*—West or East pier, Harwich; Bristol Arms pier, Shotley. There is a quay and small harbour on the east side of Trinity House pier. *Facilities.*—Water, by courtesy of Trinity House, provisions and fuel from the town. Early closing, Wednesday. Two shipyards near the quay.

FELIXSTOWE DOCK.—Entrance depth, 12 to 20 feet; 17 to 20 feet at north and south quays. *Facilities.*—Water, petrol, oil. Repairs can be carried out afloat. Bus service to Felixstowe.

RIVER ORWELL.—Enter between Shotley spit and Walton Light-buoys. Channel to Ipswich is well marked; depth 19 feet. PINMILL, about half-way up affords good anchorage and there is a hard and boatyard. Water, petrol and provisions available. Club: Pinmill Sailing Club.

WOOLVERSTONE.—Pier owned by Woolverstone Shipyard Ltd. Full repair facilities. Fuel and water obtainable from pierhead. Club: Royal Harwich Yacht Club. Offers facilities to visitors from May to September; in winter, open on Sundays only.

IPSWICH.—About one mile below Ipswich is Ostrich creek, with a few facilities. Club: Orwell Yacht Club. Lock into Ipswich dock opens 2 hours before, until 1 hour after, H.W. The wet dock has depths of 16 to 25 feet. *Facilities.*—Water, petrol, stores, repairs etc., all obtainable. Early closing Wednesday and Saturday.

RIVER STOUR.—Navigable for about 9 miles to Manningtree; buoyed for 8 miles to Mistley. Anchor off Wrabness, about 1½ miles above Harkstead point. The channel is tortuous and there is only 1 or 2 feet when nearing Mistley.

WOODBRIDGE HAVEN AND RIVER DEBEN.—About 4 miles north-eastward of Landguard point. Approach by *W.E. Haven* and *Bar* buoys. Enter over bar of shifting shingle on leading marks situated on foreshore southward of the entrance. Turn and run in close to western shore, which is steep-to. The main channel then passes eastward of Horse sand which lies in mid river. Tidal streams are strong. Pilots are advisable for strangers and are available from Felixstowe Ferry at the river entrance (dip burgee and wait off *Bar* buoy). Anchor above Horse sand clear of moorings. *Facilities.*—Water and limited provisions can be obtained from Felixstowe Ferry. Boatyard. Bus to Felixstowe. Club: Felixstowe Ferry Sailing Club.

RAMSHOLT.—Good anchorage close to quay. Landing; concrete hard and steps. Alderton 2 miles, for provisions.

WALDRINGFIELD.—On western bank about 5½ miles upstream. Landing on beach at all tides. *Facilities.*—Water, stores, fuel and repairs all available.

KINGSTON QUAY.—Channel is marked to Kingston Quay where deep water ends. Landing at hard.

WOODBRIDGE.—Landing at Ferry quay and on Ferry hard. Yachts take the mud at low water. *Facilities.*—Water, stores, fuel, oil and repairs all available. Early closing Wednesday. Club: Deben Yacht Club.

TIDAL STREAMS

Harwich Harbour.—	Off Landguard point. Mean Spring Rate 1¼ knots. Slack water at H.W. Harwich and 6 hours after H.W. Harwich.
River Orwell.—	Off Fagbury point. Mean Spring Rate 1½ knots. Slack water ½ hour after and 6 hours after H.W. Harwich.
River Stour.—	Off Parkeston Quay. Mean Spring Rate 1 knot. Slack water 5½ hours before and ½ hour after H.W. Harwich.
Woodbridge Haven and River Deben.—	In river entrance. Mean Spring Rate about 4 knots. Slack Water ½ hour before and 5½ hours after H.W. Harwich.